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Telephony.

VOLUME VIII.
NUMBER 4.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

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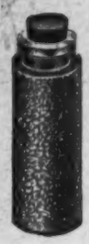

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We Fully Guarantee Our Products.

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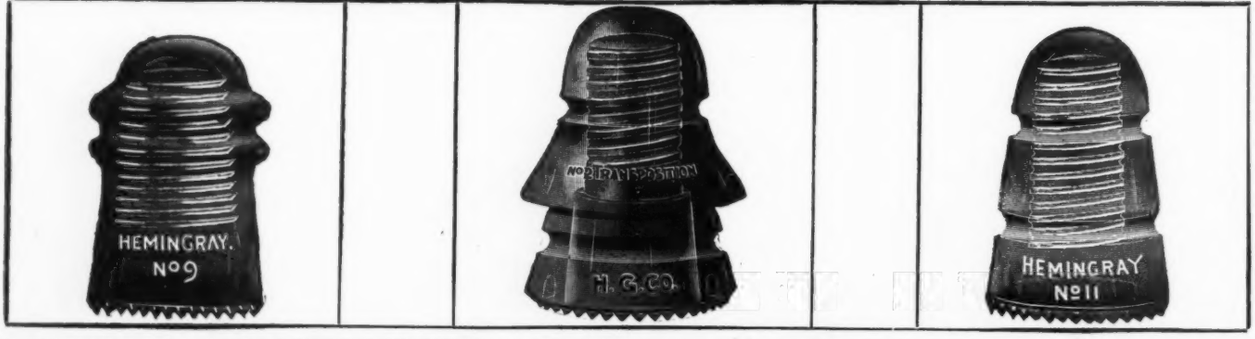

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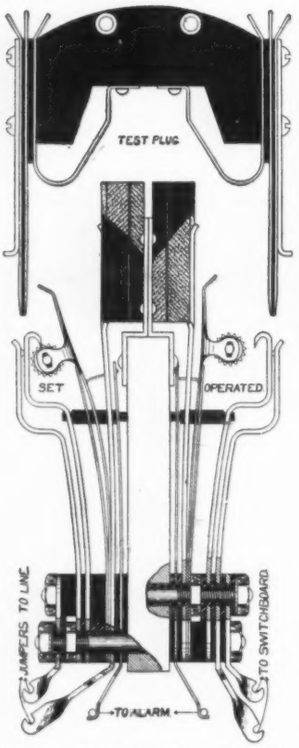

Sectional view showing Test Plug

THE ONLY ONE MANUFACTURED BY THE INVENTOR UNDER HIS OWN BROAD PATENTS AND GUARANTEED ABSOLUTELY NON-INFRINGING

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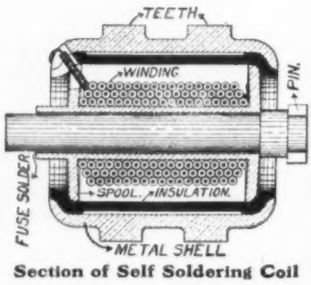

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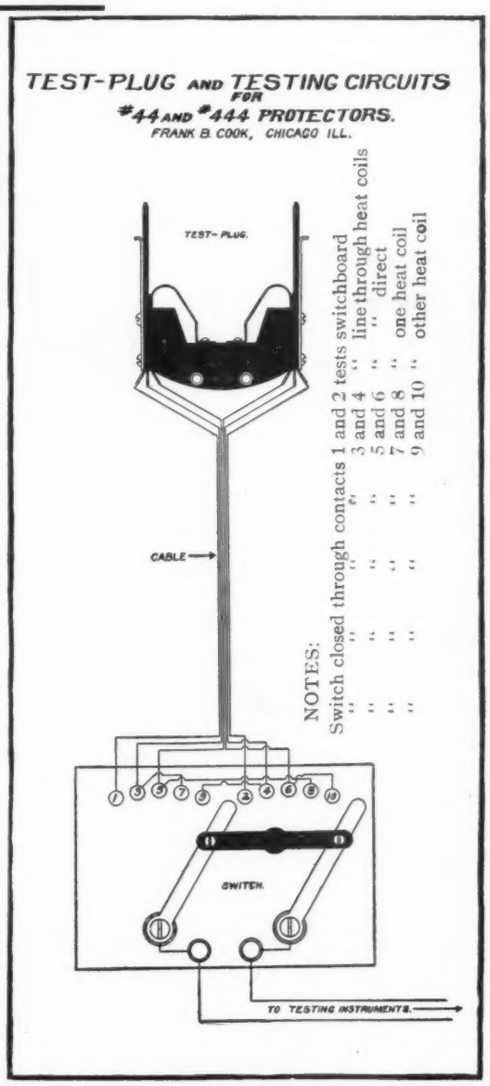
THE ONLY PROTECTOR in which the circuit controlling spring can be reset in one operation, without touching the heat coils or disturbing its position. It doesn't have to be reversed.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SWITCH.
TO TESTING INSTRUMENTS.
NOTES:
Switch closed through contacts 1 and 2 tests switchboard
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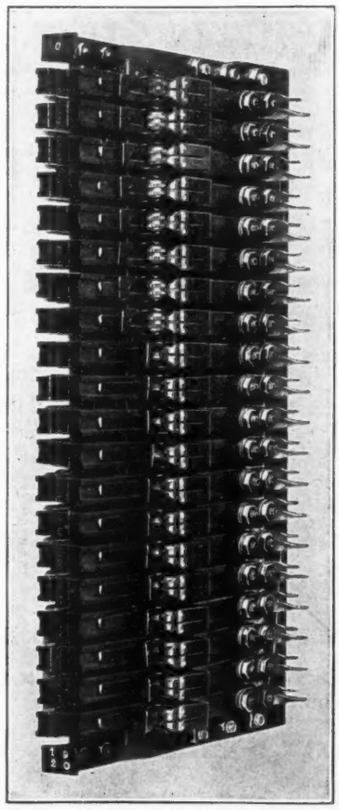
A PROTECTOR

FOR TODAY AND FOREVER
COOK'S No. 444

FOR LARGE EXCHANGES OR SMALL
COOK'S No. 444

FOR A SMALL PRICE
COOK'S No. 444

Cook's No. 444 can be furnished for any capacity from **50 pairs** up. Additions can be made at any time in banks of ten or twenty pairs.



Bank of Twenty Pairs—Side View

Here are a few of the many exchanges, large and small, which have been equipped with Cook's No. 444 Protector. **ASK THEM** if they like it. They would never have put it in had they not been satisfied it was the **BEST** and **ONLY** protector made:

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The Kentucky & Indiana Telephone Co., Owensboro, Ky.
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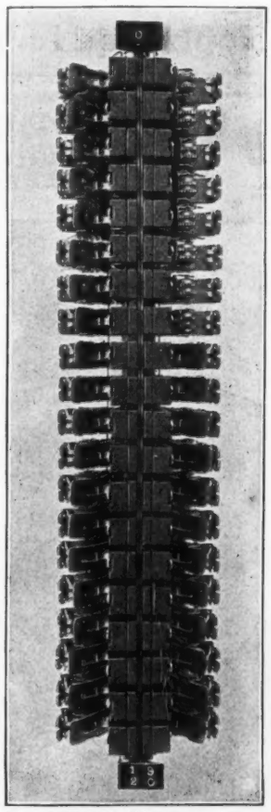
The Twin City Telephone Co., Minneapolis, Minn.

And there are a hundred others all over the country. Your next door neighbor may be one of them. Send for a bigger list.

Cook's Protectors are the only ones in actual use at the St. Louis World's Fair. They are used there by the Automatic Electric Co., The Kellogg S. B. & S. Co., The Faller Automatic Tel. Co., and the Controller Co. of America.



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DRY BATTERY OUTFIT COMPLETE.

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COST FOR BATTERY RENEWALS LESS THAN 25c A MONTH PER 100 SUBSCRIBERS. . . . .

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LISTEN { NO BELTS TO BREAK. NO BEARINGS TO OIL. NO POWER BILLS TO PAY. NO MORE GENERATORS TO BUY.

Entirely Automatic. Requires Absolutely No Attention.

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We are furnishing this Generator for selective signaling, producing pulsating current, on all orders now.

CAN RING THROUGH 500,000 OHMS, IF NECESSARY.

Write Us. We will tell you all about it. Get our latest catalogue.

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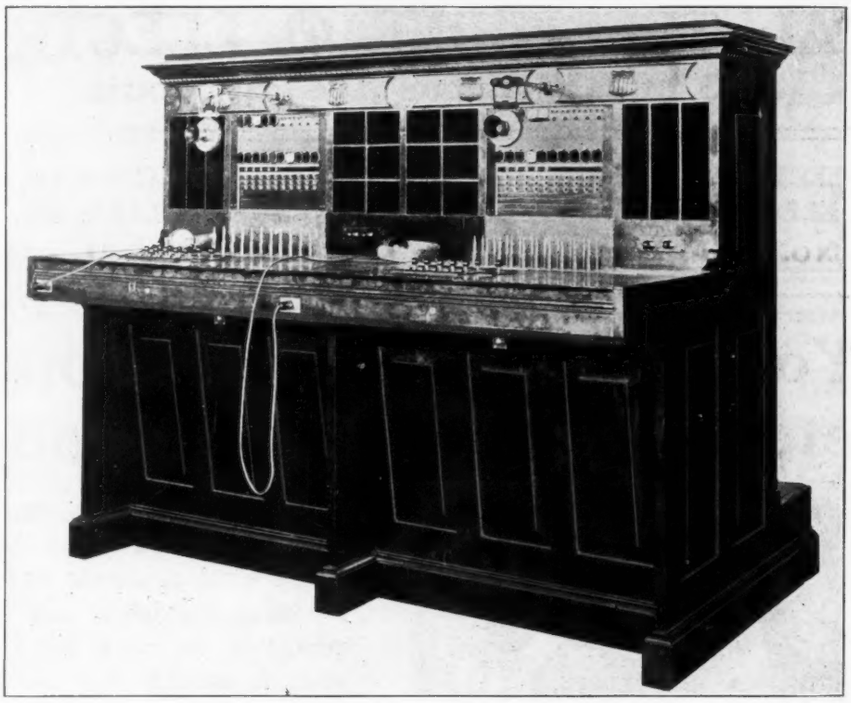

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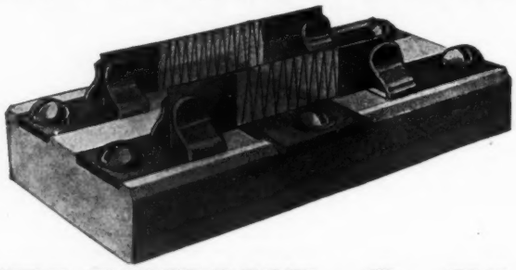

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SWITCHBOARD

Highest in Efficiency

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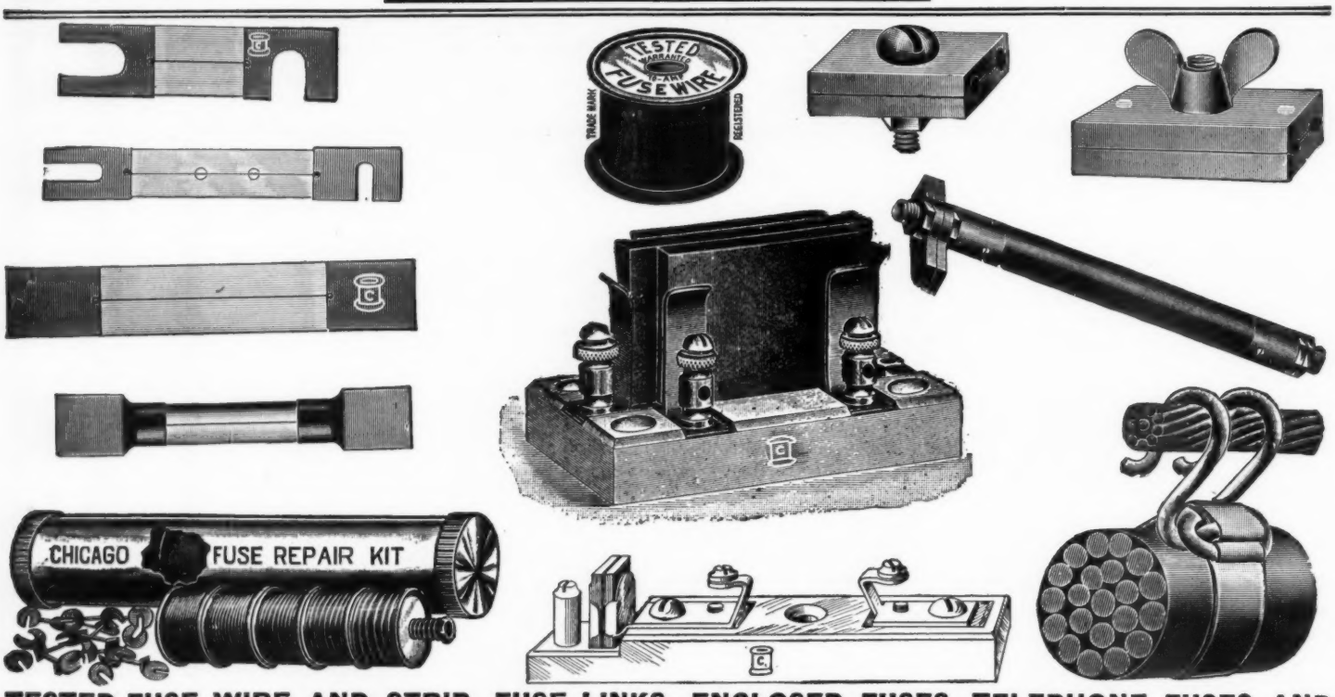
OHIO

OUR LINE OF TELEPHONE SUPPLIES IS COMPLETE.



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If you refuse to argue the question, then give in and place your orders.

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Made by continuous process from the best Rods obtainable. Possesses great Strength and high conductivity. Pliable, yet tough and uniform.

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Our Wire is known to the trade as, "Extra BB," "BB" and "Steel."

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By Chas H. Schweizer.

Secretary.

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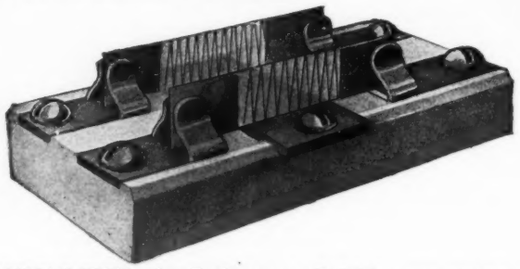
Construction Material. Large and Varied Stock. Prompt Shipment.



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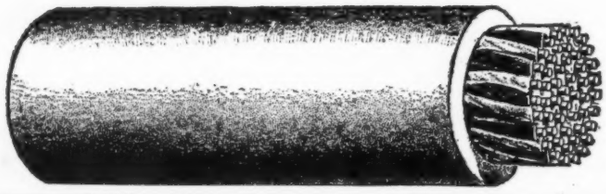

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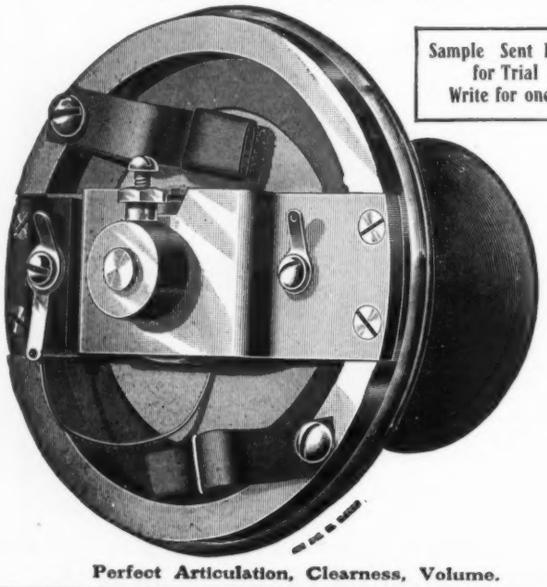

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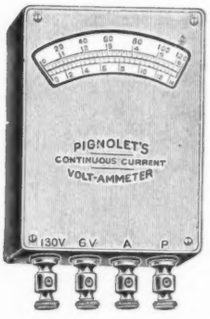
Your lines periodically for insulation and resistance.



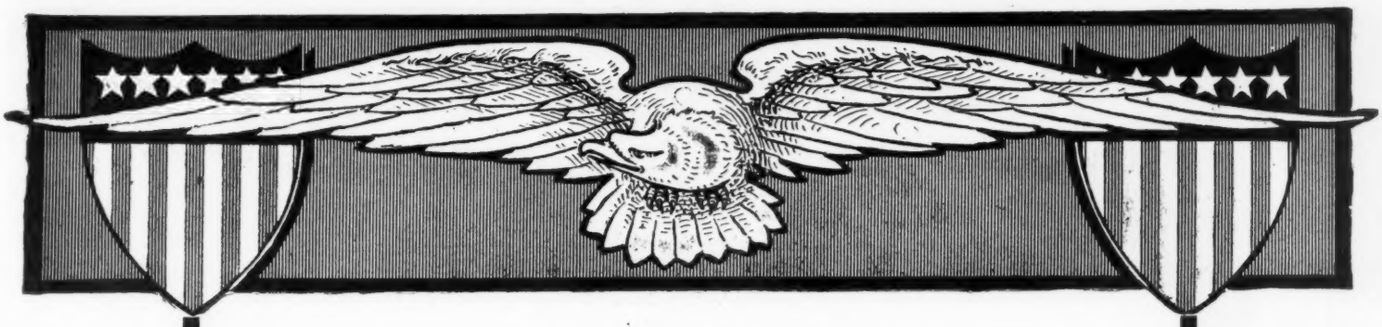
This can be best done with a Volt Ammeter. Mine are especially designed for telephone men. Their price is low too.

Write me and I'll tell you more about my goods.

Louis M. Pignolet

82 Cortlandt St., N. Y.

Please tell the Advertiser you saw his Announcement in TELEPHONY.



The "LORIMER"

The SYSTEM of the FUTURE

FULL AUTOMATIC and CENTRAL ENERGY

Patents Granted

Great Britain
France
Belgium
Italy
Spain
Sweden
India
Cape of Good Hope
Mexico
Victoria
New Zealand
South Australia
New So. Wales
Queensland
United States
Denmark
Austria
Hungary
Canada

Patents Pending

Germany
Norway
Russia
Japan
United States (5)

THE AMERICAN MACHINE TELEPHONE CO., LT'D
Piqua, Ohio, and Brantford, Canada

THE CANADIAN MACHINE TELEPHONE CO., LT'D
Toronto Canada

The Rentability of Your Line

and the life of your linemen depend on the life of your poles, crossarms, brackets and pins.

Rain and Snowstorms Lose Their Terror

where poles and crossarms were made water and rot-proof by treatment with

S. P. F. CARBOLINEUM

Every Package of the

Genuine bears this label

Ask for our 16-page circular giving details about the illustrations shown herein, also reports of tests made with S. P. F. Carbolineum by European telephone administrations and by the Am. Tel. & Tel. Co.

BRUNO GROSCHE & CO.

25 WILLIAM ST. SOLE AGENTS NEW YORK CITY

Let People Know Where You Are

DRUM SIGN
$1.50
Including Express Charges

THE F. BISSELL COMPANY
TELEPHONE SUPPLIES
TOLEDO, O.

Independent Telephone Manufacturing Co.

MADISON, WISCONSIN.

Manufacturers of

Special, High Grade

TELEPHONES

We Solicit a Trial Order

Have You Seen Our New Induction Coil.

NEW THING. JUST OUT.

Order a Sample 'Phone to-day. Don't remit if you don't like it. Just send the 'phone back.

A BONAFIDE OFFER TO BONAFIDE CUSTOMERS.

A

More Durable

AND

Better Telephone

THAN THE

"Standard"

HAS

Never Been Made

ORDER OUR TYPE "E" TRANSMITTER

Standard Telephone & Electric Co.

Office and Factory - - Milwaukee

Please tell the Advertiser you saw his Announcement in TELEPHONY.

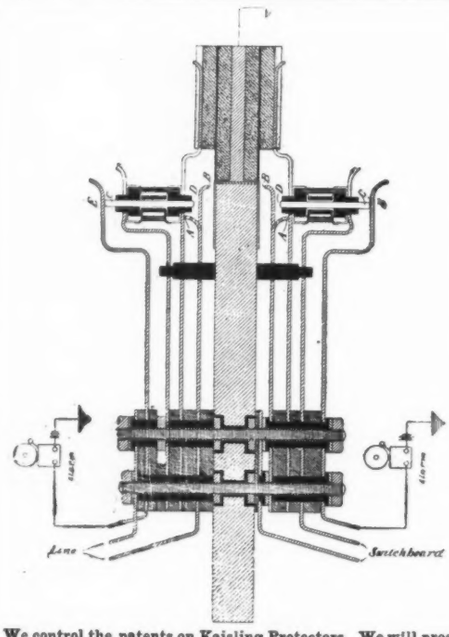
The Protector of the Future

THE KAISLING
SELF-SOLDERING PROTECTOR

In a Class by Itself

OPERATION

The pin C, which is not in the line circuit, is held normally in place by solder near its middle where it passes through a small copper spool. Insulated wire is wound around this spool forming the heat coil proper. The ends of the wire are soldered to the terminal caps of the cartridge, which make contact with the containing springs. The solder is not in the circuit at all. When the solder melts, the pin C is pressed inward by the strong spring E. The inner end of the pin moves the inside spring, striking it at point D and opening the circuit at point A. The point B is also forced over to ground. The circuit is thus opened and grounded by the operation of the coil. A local alarm circuit is also made through spring E, pin C and ground. The solder cooling, the coil is ready for use again by reversing it in the containing springs.



We control the patents on Kaisling Protectors. We will prosecute all infringers and guarantee our protectors not to infringe any valid patent. We protect our customers always.

ADVANTAGES

The first element of any protector is efficiency. The Kaisling, by test, is the most efficient protector made. It always operates, never changes, and never opens the line except when operated by an excessive current. It is not a trouble maker. It repairs itself after every operation, and never wears out. We have operated a single coil over 2,000 times without change or loss of efficiency. The Kaisling is compact, measuring two and one-quarter inches per pair, and is simple, having only four working springs.

It is well made, carefully tested, and sold at a very low price.

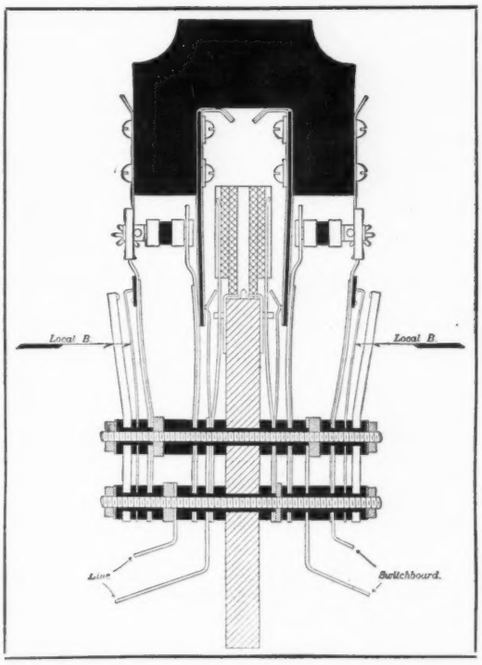
AMERICAN ELECTRIC FUSE CO.
CHICAGO NEW YORK ATLANTA

Protectors of the Past and Present

The Rolfe Protector

For two years we have made the Rolfe Protector. We shall continue to make it and furnish it to our customers, all reports to the contrary notwithstanding.

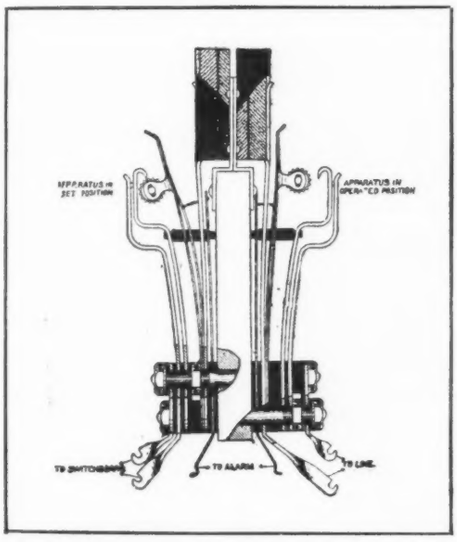
But we have found a better protector than the Rolfe, and advertise it on the opposite page, for the first time. We have made many protectors, but the Kaisling, our newest design, is far the best.



Every engineer will recommend it. Every manufacturer will adopt it. Every exchange man will use it in preference to all others. It is the protector of the future.

The Rolfe has had its day, and must give place to a better design. We shall furnish extensions for all our present Rolfe installations, but we recommend the Kaisling to new customers.

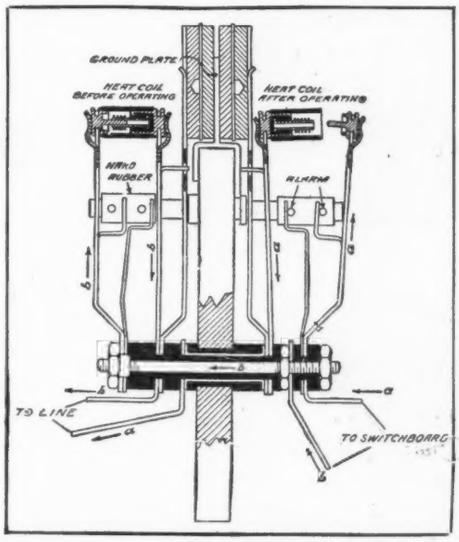
The Cook Protector
(Latest Type)



It infringes our self-soldering patents, and is inferior in efficiency, construction and durability to the Kaisling. It is an effort, not a success.

The KAISLING is the Protector of the Future

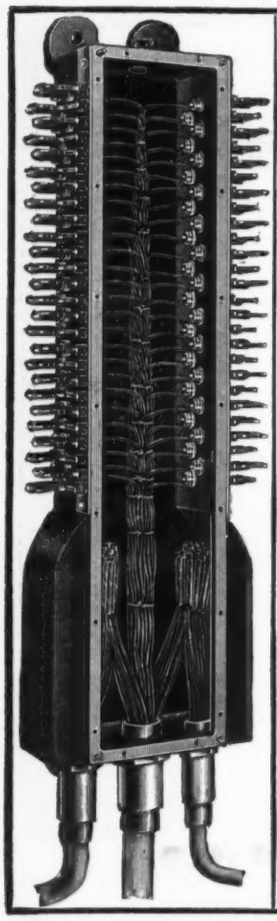
The Sterling Protector
(The Old Standard)



It is efficient but out of date. It does not have self-soldering coils and is expensive to maintain. But it does not infringe our patents, as most other protectors do.

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA



Moon Combination Terminal Head and Junction Box

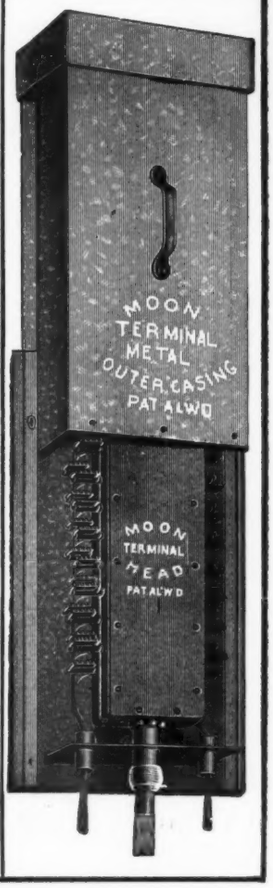
NEW—PRACTICAL—ECONOMICAL

Used to combine or distribute cable in rearranginging old lines or adding new ones or in multiple distribution. Saves all outside splices and simplifies the work of installing cable. Affords ample room for splicing in an easy manner.

Has Fuse and Carbon Protection
Self-Soldering Nozzles
Metal Outer Case or Pole Box

Made with two or more nozzles for cables up to 200 pair or larger. The Self-Soldering Nozzles make it practical. :: Prices are practical, too.

MOON MANUFACTURING CO.
43 SOUTH CANAL STREET, CHICAGO



VEEDER SWITCHBOARD COUNTERS

(STYLE 8)

Show rate of increase, so that exact calculations for the future may be made.

They likewise show how better to divide the work on the board among the operators.

Number of calls during each hour of the day can be shown. Interesting statistics are easily obtained by their use. Sockets fit in keyboard permanently. Counter can be inserted or removed at will.

Free Booklet describing 10 styles of Counters.

THE VEEDER MFG. CO.
No. 1 Sargeant St., HARTFORD, CONN.

Cyclometers, Odometers, Tachometers, Counters, and Fine Castings.

CABLE TERMINALS FOR CABLE CONSTRUCTION.

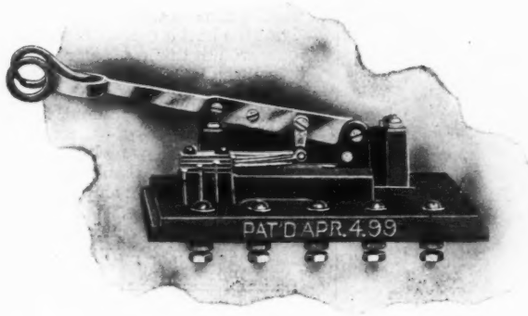
25 Pair Type B.

Hall Cable Boxes

Neat, Substantial, Convenient, Designed for Underground and Aerial Installations, in all sizes; each pair provided with lightning protection.

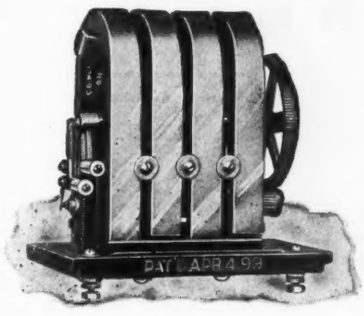
Manufactured by
THE MOUNTAIN STATE ELECTRIC CO.
Correspondence Solicited. WHEELING, W. VA.

The PARTS REMOVED



Monarch Telephones are so constructed that every part can be removed instantly. The shelves with the hook switch, induction coil and generator, slip from the cabinet without disturbing the permanent wiring. The time consumed in making repairs and inspection is reduced to a minimum.

The accompanying cuts show the shelves removed and illustrate the ease with which the repair of a coil or hook switch spring can be made. All parts of Monarch Telephones are interchangeable, as they are manufactured in our own factory and are made with tools and dies especially designed for their construction.



For a full description of all Monarch Products, write for our latest catalogue.

Notice: The MONARCH SWITCHBOARD, which has been worked upon for the past eighteen months, is now ready for sale. Parties about to purchase exchange equipment will do well to secure our prices and learn more regarding the construction of our board before placing orders.

MONARCH TELEPHONE MFG. CO.

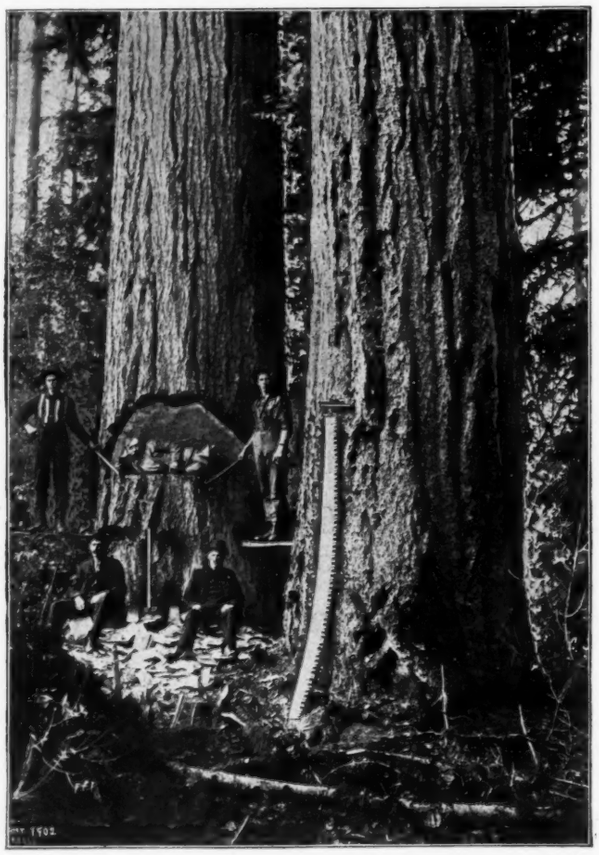
12-16 South Clinton Street Chicago, Illinois

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Washington Fir Cross Arms
Last twice as long as Ordinary Arms.
Are Stronger than other arms.
Absolutely Free from knots or defects of any kind.
Prices average as low as asked for Pine Arms.

Washington Fir Trees.

These trees often attain a height of 90 to 100 feet before branching. The logs are sometimes sixteen, eighteen or twenty feet in diameter, and are never hollow.



Knoxville, Iowa, June 25, '04
Illinois Electric Co., Chicago.

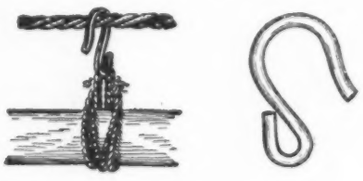
Gentlemen:—The Washington Fir Cross Arms recently received from you are the finest lot of Arms that we ever saw. They are of uniform quality, of excellent grain and soundness. The mill work and borings have been very carefully done according to specifications. It was impossible to pick out the best arm, as we usually do, for places of heavy strain, as they were all apparently of the best quality. How anyone would think of using pine arms when these can be had at the price we paid for them we are at a loss to understand, as we certainly consider them the cheapest Arm we have ever bought. We thank you for your promptness in shipping.

Yours truly,
Knoxville Electric Co.
P. E. Bellamy, Gen. Mgr.

Illinois Electric Company,
Electrical Supplies,
239-241 Madison Street, CHICAGO.

Security Marline Cable Hangers

Made to fit any size cable.



See that Snap?

No trouble.
It snaps over the strand and stays there.
Sample sent on request.

THE F. BISSELL COMPANY
Manufacturers and Jobbers of
TELEPHONE SUPPLIES
226-228-230 Huron Street
TOLEDO, O.

TELEPHONES and SWITCHBOARDS

Second Hand but Reconstructed

in a manner which guarantees

Original Appearance and Operating Qualities.

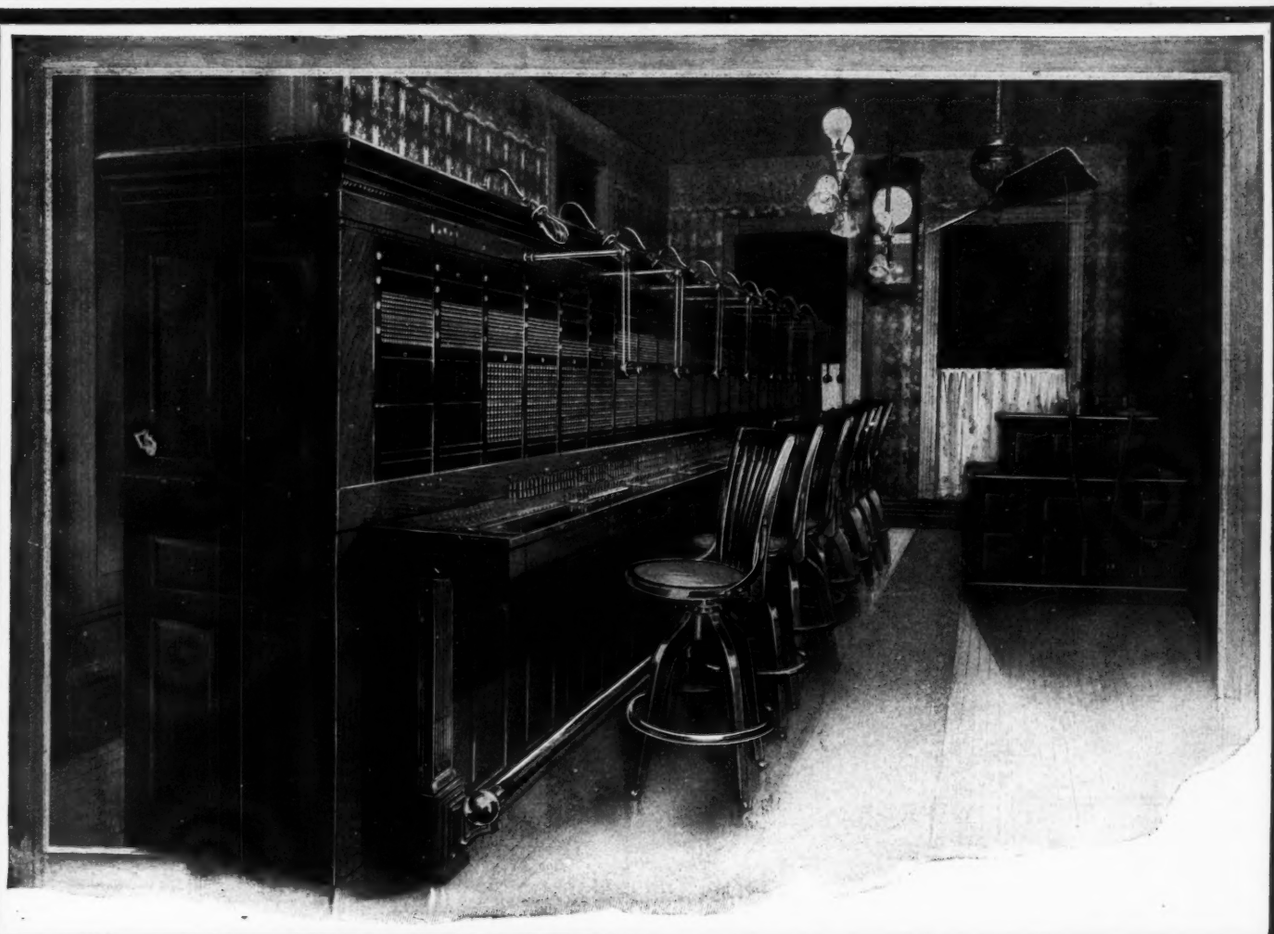
One Thousand Exchanges are purchasing reliable apparatus of this Company at reduced prices.

Why not You?

Write for Stock List. All Standard and Modern Makes.

Guarantee Telephone and Equipment Co.
73 & 75 W. Jackson Boulevard, CHICAGO, ILL.

Where Quality Stands First



MAKERS OF TELEPHONE APPARATUS

Multiple Boards — Transfer Boards — Village Boards
Central Energy — Magneto Call
Exchange Telephones — Rural Telephones — Factory Telephones

MANUFACTURED DIRECT FROM THE RAW MATERIAL

THE NORTH ELECTRIC COMPANY

WRITE FOR CATALOG

149-159 Clair St., CLEVELAND, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

WE MANUFACTURE
LEAD COVERED CABLE

Our factory is equipped with the latest and most improved machinery which enables us to meet the most exacting specifications of the purchaser.

We Manufacture Cable with from 5 to 400 Pairs, and Guarantee Satisfaction.

SUPERIOR QUALITY

PROMPT DELIVERY

We make this product the same quality as our regular telephone apparatus.

A majority of the INDEPENDENT Telephone Exchanges have tested its quality in a most practical way—by using large quantities.

When in the market don't fail to get our prices.

Stromberg-Carlson Telephone Mfg. Co.

Gen'l Offices, ROCHESTER, N. Y. **Western Sales Office, CHICAGO, ILL.**

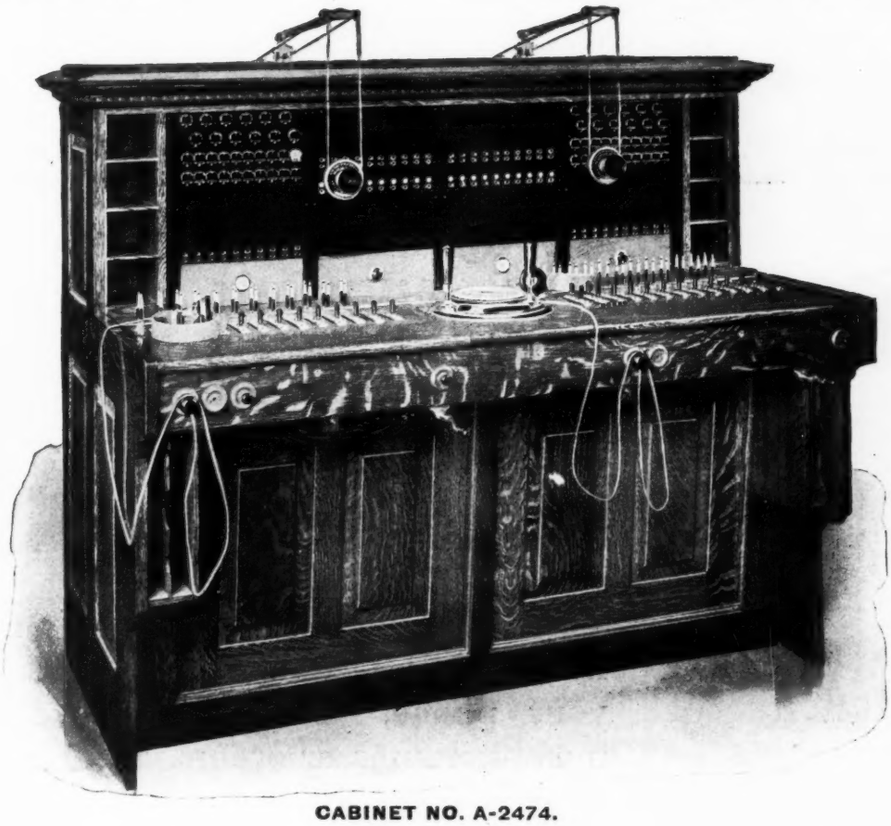
IF WE BUILD YOUR TOLL BOARD

ECONOMY IN OPERATING EXPENSES IS ASSURED

OUR VARIED AND EXTENSIVE EXPERIENCE IN THIS LINE OF WORK IS UNEQUALLED.

Two Guarantees

Our Name ***Our Experience***



CABINET NO. A-2474.

The above illustration shows our standard two position toll board.

We shall soon have ready for distribution a Bulletin devoted to toll boards exclusively.

We are anxious to have a copy placed in the hands of every telephone exchange *Manager* interested in this subject. The discussion of the subject of "Toll Equipment of Telephone Exchanges," and the other information contained in this bulletin is well worth the effort necessary to get a copy.

Stromberg-Carlson Telephone Mfg. Co.

Gen'l Offices, ROCHESTER, N. Y. **Western Sales Office, CHICAGO, ILL.**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Crawfordsville Wire and Nail Co.

MANUFACTURERS OF

"MONARCH" BRAND HIGH GRADE

Telephone and Telegraph

--WIRE--

E. B. B.-B. B.-STEEL

Single and Double Galvanized Signal Strand

OUR WIRE STANDS THE MOST EXACTING TESTS.

IF YOUR SUPPLY HOUSE CANNOT FURNISH IT, WRITE US. WE CAN.

PROMPT SHIPMENTS ALWAYS.

CRAWFORDSVILLE WIRE & NAIL CO.

CRAWFORDSVILLE, INDIANA, AND 1501 MONADNOCK BLDG., CHICAGO.

"READY" MEMORANDUM PAD HOLDERS

PATENTED

The "Ready" Pad Holder is neat, ornamental and useful. When placed beside your phone, you always have paper for memorandums or orders. Each holder has straight edge, which holds writing pads and tears off memorandums.

No. 1 Style fastens to the wall beside phone.

No. 2 Style fastens to the telephone.

Either Style $1.00 each.
By mail, prepaid, $1.25 each.
Agents Wanted.

No. 1

WE MANUFACTURE

READY PAY OUT REELS and READY SPECIALTIES.

WE CARRY COMPLETE LINE OF TELEPHONE SUPPLIES

THE W. G. NAGEL ELECTRIC COMPANY, 520 ADAMS ST. TOLEDO, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Intercommunicating Wall and Desk Telephones

For Warehouse, Office, Factory, etc. We manufacture our own apparatus and maintain a high standard and guarantee our instruments to be perfect electrically and mechanically.

Workmanship is of the best and only materials are used that will give perfect service under most severe conditions.

Estimates furnished on application for complete installations except labor.

Everything in Telephones and Telephone Supplies.

GENERAL TELEPHONE CATALOGUE No. 19
TELEPHONE PARTS CATALOGUE

Electric Appliance Company

TELEPHONE MANUFACTURERS ℣ ELECTRICAL SUPPLIES

Chicago and San Francisco

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Look for the Tags

They are your protection against inferior quality

Our

Telephone and Telegraph Wires

are

Extra Double Galvanized

with the finest grade of pure zinc. Every bundle bears a tin tag and lead car seal, as shown in the photographs, and is

Guaranteed Standard Quality

THE NATIONAL WIRE CORPORATION

WORKS: NEW HAVEN, CONN.

General Offices: Engineering Building, 114-116 Liberty St., NEW YORK, N. Y.

Sales Offices and Warehouses:

New York, Boston, Chicago, DeKalb, Kansas City, San Francisco

WIRE ROPE ∴ WIRE STRAND

Ask for Special Price Lists, with Tables.

EITHER WAY YOU LOOK AT IT!

From the standpoint of quality or with a view to securing prompt shipment, it will pay you to send us your orders. There are no better telephones made than our "Williams-Abbott" and "Central." Every instrument is guaranteed and no detail is overlooked that will add to their efficiency. Our stock of construction material and appliances is also large and our prices attractive.

LET US QUOTE YOU

Central Electric Company

264-266-268-270 Fifth Avenue : : : CHICAGO

TRY THE STROUD CONTROLLERS ON THE KINLOCH SERVICE AT THE FAIR:
IT'S WORTH MORE THAN A NICKEL TO KNOW HOW THEY WORK

USE THE

Controllaphone

AT THE FAIR.

Visit the

Controller Company

SECTION 19 PALACE OF ELECTRICITY.

We're there with

the goods

For Measured Service

Get a copy of "Deadheads vs. Dividends," for an eye opener.

The Controller Company of America,

1061 MONADNOCK BLOCK, CHICAGO.

Section 19 Electricity Bldg., World's Fair Grounds.

OUR CONTROLLERS ARE LOOKING AT YOU WHEREVER YOU GO ON THE FAIR GROUNDS

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Silk Cords

Switchboard Cords

"THERE IS BUT ONE SUCCESSFUL STEEL CORD AND WE MAKE IT"

P. B.
REMLER
B.

Write for New Prices

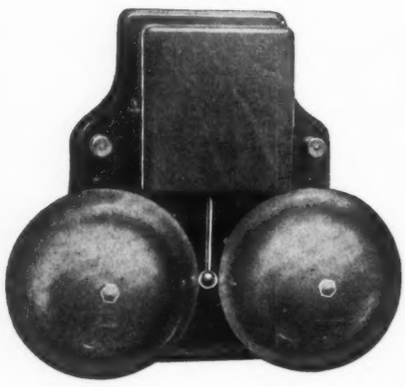
Samples on Application

THE McDERMID MFG. COMPANY

118 W. JACKSON BOULEVARD, CHICAGO

Loud Ringing

The Holtzer-Cabot Electric Company



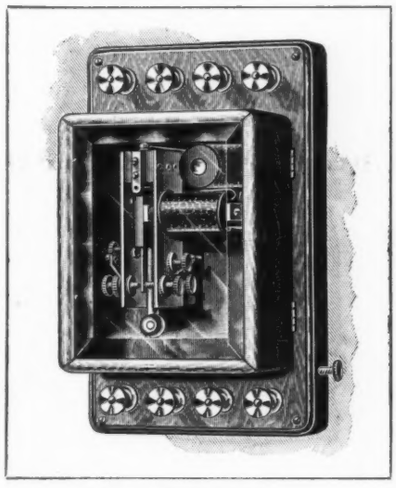
Brookline
New York
Chicago

Extension Bells

ILLINOIS POLE CHANGER

The Latest Development in Ringing Generators

Is Adapted to Use Where Either or Both Alternating and Pulsating Currents are Required.



NUMBER 1 STYLE

Absolutely Guaranteed to Meet All Ringing Requirements. Will Ship on Thirty Days' Trial.

Size only 9x6x5 inches. Weighs but five pounds.

Made Up in Four Different Styles.

Write for Descriptive Circular and Prices.

Illinois Electric Specialty Company

171-173 South Canal Street CHICAGO, ILL.

OSCAR WENTWORTH ROGERS' ESTIMATES FOR TELEPHONE PLANTS IN IOWA FALLER AUTOMATIC OPERATOR. ALL LINES UNDERGROUND.

ITEMS	Place	Over 25,000, under 50,000			Over 10,000, under 25,000			Over 5,000, under 10,000			Over 2,000, under 5,000		
	Des Moines (62139)	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant
	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't
		Dubuque	36,297		Burlington	23,201		Ft. Madison	9,278		Albia	2,889	
		Davenport	35,254		Clinton	22,698		Oskaloosa	9,212		Algona	2,911	
Business Phones	1,000	Sioux City	33,111	800	Ft. Dodge	12,162	500	Boone	8,880	250	Ames	2,422	100
Residence Phones	2,000	Council Bluffs	25,802	1,700	Keokuk	14,641	1,000	Iowa City	7,987	500	Anamosa	2,891	300
Business Rates	15	Cedar Rapids	25,656	15	Marshalltown	11,544	15	Creston	7,752	15	Belle Plaine	3,283	15
Residence Rates	10		156,120	10	Muscatine	14,073	10	Mason City	6,746	10	Bloomfield	2,105	10
Av. Length Lines	½m.			½m.	Ottumwa	18,197	½m.	Cedar Falls	5,319	½m.	Carroll	2,882	½m.
Percentage Conduits	100			100	Waterloo	12,580		Centerville	5,256		Chariton	3,989	½m.
Connectors per 100 Subscribers						129,096	100	Oelwein	5,142		Charles City	4,227	
								Atlantic	5,046	100	Cherokee	3,865	100
									70,618		Clarinda	3,276	
											Colfax	2,053	
											Corning	2,145	
											Cresco	2,806	
											Decorah	3,246	
											Denison	2,771	
											Eagle Grove	3,557	
											Eldora	2,233	
											Emmettsburg	2,361	
											Estherville	3,227	
											Fairfield	4,689	
											Glenwood	3,040	
											Grinnell	3,860	
											Hamburg	2,079	
											Hampton	2,727	
											Harlan	2,422	
											Independence	3,656	
											Indianola	3,261	
											Iowa Falls	2,840	
											Jefferson	2,601	
											Knoxville	3,131	
											Lake City	2,703	
											La Mars	4,146	
											Manchester	2,887	
											Maquoketa	3,777	
											Marengo	2,007	
ESTIMATED COST											Marion	4,102	
											Missouri Valley	4,010	
Central Equipment	60,000										Monticello	2,104	
Subscribers' "											Mt. Pleasant	4,109	
Building	5,000										Nevada	2,472	
Conduits	25,000										Mew Hampton	2,389	
Armoured Cables	36,876										Newton	3,682	
Manholes	4,600										Osage	2,734	
Engineering Exps.	10,000										Osceola	2,525	
Contingencies	5,000										Pella	2,623	
Distributing, &c.	36,000										Perry	3,986	
											Red Oak	4,355	
											Sac City	2,079	
Total	$182,476			152,065			91,238			45,619			24,360
											Sheldon	2,282	
											Shanandoah	3,573	
											Spencer	3,095	
											Storm Lake	2,169	
											Speart	2,079	
											Tama	2,649	
											Tipton	2,513	
											Villisca	2,211	
											Vinton	3,499	
											Washington	4,255	
Capitalization per Phone	61			61			61				Waukon	2,153	61
											Waverly	3,177	
DEPRECIATION											Webster City	4,613	
											What Cheer	2,746	
Conduits, 3%	3,524										Winterset	3,039	
Other Plant, 6%	3,600											194,188	
Total	$7,124			5,940			3,562			1,781			960
EXPENSES													
Engineer and Manager	1,500												
Assistant	720												
Sec.-Tr. and Bookkeeper	900												
Storekeeper	360												
Stenographer	960												
4 Inspectors @ $60	2,880												
Heat, Light, &c	1,000												
Total	$8,320			6,950			4,160			2,750			1,500
SUMMARY													
Revenue	35,000			29,000			17,500			8,750			4,500
6% on Capital	14,598			12,165			7,299			3,650			1,948
Depreciation	7,124			5,940			3,562			1,781			960
Expenses	8,320			6,950			4,160			2,750			1,500
Surplus	4,958			3,945			2,479			569			92

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN IOWA

FALLER AUTOMATIC OPERATOR. ALL LINES UNDERGROUND.

Over 1,000, under 2,000

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Ackley	1,445	
Adel	1,213	
Afton	1,178	75
Akron	1,029	125
Alton	1,009	15
Audubon	1,866	10
Avoca	1,627	½m.
Bedford	1,977	
Bellevue	1,607	
Belmond	1,234	100
Britt	1,540	
Brooklyn	1,188	
Calmar	1,003	
Cascade	1,266	
Cincinnati	1,212	
Clarion	1,475	
Clear Lake	1,706	
Columbus Jct.	1,099	
Coon Rapids	1,017	
Corydon	1,477	
De Witt	1,383	
Dunlap	1,355	
Dyersville	1,323	
Eddysville	1,230	
Eldon	1,850	
Elkader	1,321	
Farmington	1,332	
Fayette	1,315	
Fonda	1,180	
Forest City	1,758	
Garner	1,283	
Grand Jct.	1,113	
Greene	1,192	
Greenfield	1,300	
Grundy Center	1,322	
Guthrie Center	1,193	
Guttenberg	1,620	
Hartley	1,006	
Hawarden	1,810	
Hedrick	1,035	
Humboldt	1,474	
Ida Grove	1,967	
Keosauqua	1,117	
Lake Mills	1,293	
Lamont	1,540	
Lansing	1,438	
La Porte	1,419	
Lenox	1,014	
Leon	1,905	
		12,180
Logan	1,377	
Lucas	1,132	
McGregor	1,498	
Madrid	1,021	
Malvern	1,166	
Manning	1,169	
Manson	1,424	
Mapleton	1,099	
Montezuma	1,210	
Moulton	1,420	
Mt. Ayr	1,729	61
Mt. Vernon	1,629	
Mystic	1,758	
Nashua	1,263	
New London	1,003	
New Sharon	1,252	
Nora Springs	1,209	
		480
Northwood	1,271	
Odebolt	1,432	
Onawa	1,933	
Orange City	1,457	
Parkersburg	1,164	
Rhinebeck	1,203	
Rockford	1,080	
Rock Rapids	1,776	
Rock Valley	1,054	
Rockwell City	1,222	
Sabula	1,029	
Sanborn	1,249	
Seymour	1,703	
Sibley	1,289	
Sidney	1,143	
Sigourney	1,952	
Sioux Rapids	1,005	
Spirit Lake	1,219	
State Center	1,008	
Story City	1,197	
Strawberry Pt.	1,012	
Sumner	1,437	
		863
Toledo	1,941	
Truer	1,458	
Valley Jct.	1,700	
Wapello	1,398	
W. Burlington	1,044	
W. Liberty	1,690	
West Union	1,935	
Williamsburg	1,100	
Wilton	1,233	
Woodbine	1,285	
	133,124	
		2,375
		975
		480
		863
		57

Over 500, under 1,000

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Adair	878	
Alden	709	
Allerton	950	30
Alta	561	70
Anita	968	15
Arlington	863	10
Armstrong	907	½m.
Ashton	513	
Aurelia	621	
Bancroft	839	100
Batavia	533	
Battle Creek	542	
Beacon	953	
Birmingham	922	
Blairstown	592	
Blanchard	520	
Blockton	704	
Bonaparte	898	
Brighton	807	
Buffalo Center	875	
Burt	504	
Bussey	550	
Comanche	713	
Cambridge	667	
Carlisle	553	
Carson	632	
Casey	568	
Center Point	674	
Central City	623	
Charter Oak	772	
Churdan	626	
Clarence	675	
Clarksville	849	
Clearfield	698	
Clermont	513	
Coin	574	
College Springs	693	
Colling	540	
Correctionville	935	
Corwith	651	
Cumberland	591	
Dallas Center	625	
Davis City	617	
Dayton	753	
Delmar	592	
Delta	691	
Dexter	795	
Doon	545	
Dows	818	
		6,090
Durant	560	
Dysart	902	
Earlham	630	
Earlville	618	
Early	579	
Edgewood	565	
Elgin	635	
Elliott	516	
Elma	976	
Emerson	502	
Epworth	549	
Essex	710	
Exira	851	
Fairbank	644	
Farley	513	
Farragut	514	
Fontanelle	853	
		240
Fredericksburg	565	
Fremont	542	
Garden Grove	651	
Gilmore City	687	
Gladbrook	842	
Glidden	783	
Goldfield	628	
Gowrie	681	
Gravity	549	
Griswold	900	
Hamilton	538	
Hawkeye	518	
Hazelton	500	
Holstein	870	
Hopkinton	767	
Hubbard	676	
Hull	626	
Hunneston	945	
Ireton	545	
Jesup	690	
Jewel	947	
Kalona	530	
		400
Kellogg	653	
Keota	996	
Kingsley	720	
Lake Park	541	
Lake View	591	
Lamont	636	
Laurens	853	
Lawler	646	
Le Claire	997	
Lehigh	806	
Lewis	613	
Limesprings	605	
Lineville	690	
Lisbon	956	1,150
Livermore	618	487
Lohrville	597	240
	42,760	400
		23

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Lone Tree	600	
Lorimer	587	
Lowden	544	30
Luverne	534	70
Manilla	773	15
Marathon	659	10
Marble Rock	573	½m.
Marcus	718	
Maxwell	810	
Mechanicsville	703	100
Mediapolis	725	
Milo	585	
Milton	849	
Mitchellville	768	
Monona	674	
Monroe	917	
Montour	502	
Montrose	748	
Moravia	632	
Morning Sun	948	
Moville	507	
Murray	949	
Neola	921	
New Albin	543	
Newell	762	
New Hartford	570	
New Market	600	
North English	683	
North McGregor	616	
Norway	533	
Oakland	913	
Ocheyedan	599	
Ogden	933	
Olin	692	
Ossian	670	
Oxford Jct.	780	
Oxford	664	
Pacific Jct.	732	
Panora	958	
Paulina	617	
Peterson	521	
Pleasantville	738	
Pocahontas	625	
Pomeroy	910	
Porterville	984	
Prairie City	808	
Preston	593	
Pringham	814	
Radcliffe	645	
		6,090
Redfield	509	
Remsan	835	
Riceville	804	
Richland	534	
Riverside	698	
Riverton	687	
Rockwell	830	
Rowland	577	
Rolfe	994	
Russell	636	
Ruthven	787	
Sabula	918	
St. Ansgar	698	
Salem	578	
Scranton	683	
Sheffield	688	
Shelby	692	
		240
Shell Rock	839	
Schaller	661	
Shellsburg	511	
Sioux Center	810	
Sloan	643	
Springville	599	
Sutherland	722	
Tabor	934	
Tripoli	655	
Union	589	
Vail	578	
Victor	612	
Welker	505	
Wall Lake	659	
Walnut	878	
Waucoma	540	
Wellman	654	
Wesley	730	
West Bend	538	
West Branch	647	
West Decorah	531	
West Point	654	
		400
Whiting	572	
Whittemore	522	
Williams	500	
Winfield	820	
Winthrop	618	
Woodward	550	
Wyoming	794	
	64,362	
		1,150
		487
		240
		400
		23

To the Managers and Owners of Telephone Companies in Iowa:

The Rogers Telephone Company for West Union was formed to follow the construction account, for that town, set out in annexed account. We then struck hands with the local independent company and much has been done to make ready for energetic action.

We have now formed the Rogers Telephone Company for Iowa, and will soon have contracts with several independent companies. These contracts cover the whole ground from commencing by operating the present grounded toll lines, and then operating the local plant as a central energy plant, and then finally heeding progress and changing to all lines underground and automatic exchanges.

We have also just formed the Rogers Telephone Company for Illinois, and our people are now preparing to swiftly follow the lead of the Iowa company.

Many of the best men in the business have been fully converted to our plans, and are coming to us in the right spirit.

Three other state companies are in the process of being organized.

We cannot doubt the fairness and ability of men who have, throughout the West, brought the Bell to bay.

We shall deal with the honest Independents and with them alone.

We shall go on at West Union and at the proper time you shall have a chance to see demonstrations that will leave no ground for denial or doubt.

We can show this now in New York. We have shown this to many right men and will show this yet to others.

In Fayette County, the Independents have 305 miles of lines. The Bell has only 152 miles.

The Independents have two-thirds more instruments than has the Bell.

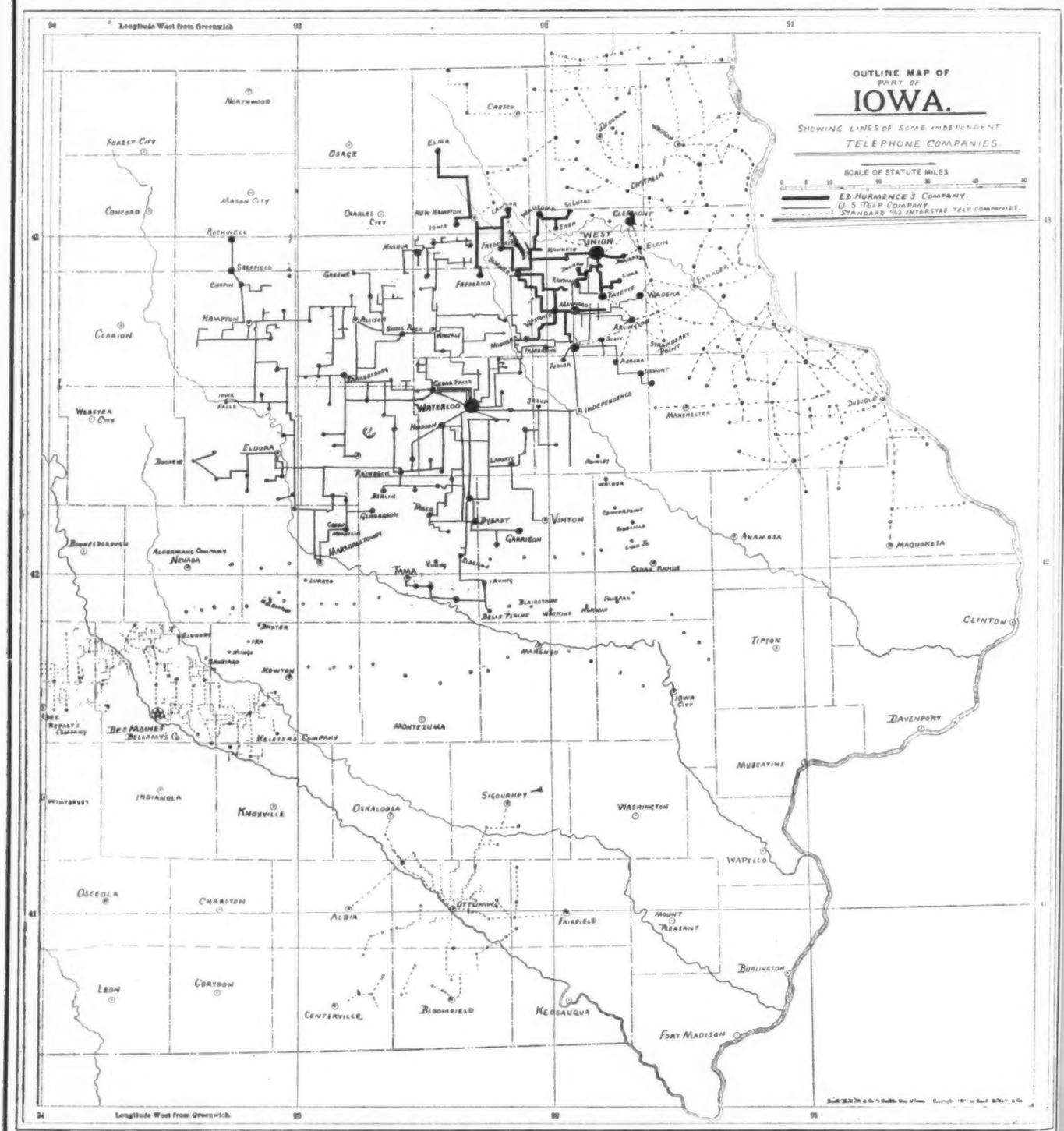
How ridiculous is the claim of the Bell that it can compete with people who own and operate their own local plants!

OSCAR WENTWORTH ROGERS.

West Union, Iowa. Sept. 20, 1904.

To the People of Iowa:

Showing how the present Independent companies can join and have long distance business through every part of the state (see text). The farmer can be served. Showing how, under Sec. 2161 of the code, the Telegraph Companies can be made to do right.



TO THE PEOPLE OF IOWA: We can connect every exchange and toll station in Iowa with West Union, and operate them from West Union. The Independents can get along without the telegraph and railway lines. They will have to have the Independent telephones very soon. We will show simultaneous telephony and telegraphy at West Union and over lines of the Hurmence and Pleggenkuhle Company so perfectly that the C., R. I. & P. R. R., will be obliged to compel the Western Union to accept traffic, or to build its own lines, as has the I. C. R. R. built its own copper metallic circuits. The Independents hold the situation, and we shall prove the way to join the proper interests and to traffic with the farmers in a rightful and enduring way.

OSCAR WENTWORTH ROGERS

Sept. 20, 1904.

To the People of the State of Iowa:

The people of Brantford, Ontario, have been making a fight for a municipal System of Telephones. On September 9th the Telephone Committee of the City Council by a vote of four to two, decided to report in favor of Municipal Telephones. The Press report sent to me by my Attorneys in Canada says that the two members of the committee opposing the system expressed themselves as opposed to a continuance of the monopoly of the Bell Co., but favored competition by a rival Company. The opposition proposes rates of twenty-five, and fifteen dollars. Pending the contest the Bell Co. and its creatures made the usual sneaky fight against the interests of the people. There appeared quotations in the public press from some author, (name not given) stating that it was believed that the application which I made in 1902 for the Franchise in Hamilton, was in the interests of the Bell Co., that the Franchise was got and then not appropriated, leaving the Bell a clear field. No honest man would write such stuff. The facts were these:

The majority of the Committee on Telephones were friends of the Bell Co., and they offered me a franchise the terms of which were fantastic and evidently made for the purpose of making it impossible for anyone to comply with them. My friends and my attorneys made such a hard fight, however, that the Bell and its creatures had to make some sort of a showing, and a Committee was appointed to go into the U. S. to examine and report on Independent and competitive telephony. (See Sept.. 1903, Telephony for a description of the actions of that Committee.) It stayed a week in the U. S., then went home and reported that it was not desirable for any community to have competition in telephones, unless it was to regulate some very grave evil. The Council afterwards gave the Bell an exclusive franchise at forty-five and thirty dollar rates. A citizen commenced proceedings to quash the exclusive franchise By-law; the Court decided in favor of the Bell; an appeal from that decision is now pending, and it is as certain as anything can be that this exclusive franchise will be finally invalidated. (See Dec., 1903, number of Telephony for the record, entitled "Chronology of the Telephone Test Case at Hamilton, Ontario.")

It is extremely gratifying to observe that the people of Brantford have seen through the Bell methods and have heeded the evidence of the value of competition even to the point of wiping out the Bell Co. at Brantford. The people of Hamilton must now begin to understand that an exclusive franchise in favor of the Bell Co. at rates of forty-five and thirty dollars is a thing that cannot be endured.

On the opposite page the Rogers Telephone Co. for Iowa, sets forth a new map showing the possibilities of of the Sumner Telephone Co., and the U. S. Telephone Co., being able to connect in turn with every telephone Co. in Iowa. We have particularly set forth lines of the Standard Telephone Co., and the Interstate Telephone Co. These companies cover the territory from Dubuque up through the N. E. Counties of the State. The Rogers Telephone Co. for Iowa will soon have contracts with several Independent Telephone Co.'s covering the portion of the whole N. E. territory and down to DesMoines and beyond.

In the Sept. number of Sound Waves, there appears the following: "On Aug. 20th, Sound Waves received the following from a correspondent (sic.) at West Union, Iowa: 'There seems to be nothing doing in the Oscar Wentworth Rogers scheme at present.' I would like to know the name of the 'correspondent.' It is probably the Bell Co. agent. What we are doing there is satisfactory to F. Y. Whitmore, C. H. Talmadge, H. P. Hancock, Omar A. Rogers and T. L. Green. As we have an agreement with the Sumner Telephone Co., it does not seem probable that Sound Waves will have any influence in that part of Iowa. I also believe that the manufacturer who is inspiring these puerile efforts of Sound Waves will not gain anything by his conduct. There will soon be enough doing at West Union and in Iowa to satisfy all honest Independent telephone people. I am constantly receiving requests from telephone men in Iowa, for association with our Company. There will be a concerted action to fit forever the interests of the Independent telephone people in Iowa as against the decaying Bell Co. (See the record of Incorporation of the Rogers Telephone Co. for Iowa, and of the Rogers Telephone Co. for Illinois.)

OSCAR WENTWORTH ROGERS

West Union, Iowa, Sept. 20th., 1904.

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN ILLINOIS

Faller Automatic Operator.
ALL LINES UNDERGROUND.

ITEMS	Place: Chicago 1,698,575	Over 25,000, under 50,000			Over 10,000, under 25,000			Over 5,000, under 10,000			Over 2,000, under 5,000		
		TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant
	Acct.	Name	Pop.	Acc't	Name	Pop.	Acc't	Name	Pop.	Acc't	Name	Pop.	Acc't
Business Phones	30,000	East St. Louis	29,655		Alton	14,210		Belvidere	6,937		Abingdon	2,022	
Residence Phones	60,000	Joliet	29,353		Aurora	24,147		Blue Island	6,114		Aledo	2,081	
Business Rates	15	Quincy	36,252	800	Belleville	17,482	500	Canton	6,564	250	Anna	2,618	100
Residence Rates	10	Rockford	31,051	1,700	Bloomington	23,286	1,000	Centralia	6,721	500	Batavia	3,871	300
Av. Length Lines	½m.	Springfield	34,159	15	Cairo	12,566	15	Champaign	9,093	15	Beardstown	4,827	15
Percentage Conduits	100	Peoria	56,100	10	Danville	16,354	10	Charleston	5,488	10	Braidwood	3,279	10
Connectors per 100 Subscribers			216,580	½m.	Elgin	22,433	½m.	Chicago Hgts	5,100	½m.	Bushnell	2,490	½m.
					Evanston	19,259		Dekalb	5,904		Carbondale	3,318	
					Freeport	13,258		Dixon	7,917		Carlinville	3,502	
					Galesburg	18,607	100	Galena	5,005	100	Carmi	2,939	100
					Jacksonville	15,078		Harvey	5,395		Carrollton	2,355	
					Kankakee	13,595		Kewanee	8,382		Carthage	2,104	
					La Salle	10,466		Lincoln	8,962		Chester	2,832	
					Moline	17,248		Litchfield	5,918		Clinton	4,452	
					Ottawa	10,588		Macomb	5,375		Coal City	2,607	
					Rock Island	19,493		Mattoon	9,622		Collinsville	4,021	
					Streator	14,079		Monmouth	7,460		Decatur	2,075	
						282,129		Mount Vernon	5,216		Downer's Grove	2,103	
								Murphysboro	6,463		Dundee	2,765	
								Oak Park	7,500		Du Quoin	4,353	
								Pana	5,530		Dwight	2,015	
								Paris	6,105		Edwardsville	4,157	
								Pekin	8,420		Effingham	3,774	
								Peru	6,863		Fairbury	2,187	
								Springvalley	6,214		Fairfield	2,338	
								Sterling	6,509		Flora	2,311	
								Urbana	5,728		Fulton	2,685	
								Waukegan	9,426		Galva	2,682	
									189,728		Geneseo	3,356	
											Geneva	2,446	
											Gibson City	2,054	
											Granite	3,122	
											Greenville	2,504	
											Harlem	4,085	
											Harrisburg	2,202	
											Harvard	2,602	
											Harvard Junc	2,602	
											Havana	3,268	
											Highland Park	2,806	
											Hinsdale	2,578	
											Hoopeston	3,823	
											Hospital	2,500	
											Jerseyville	3,517	
											Lagrange	3,969	
											Lake Forest	2,215	
											Lemont	2,449	
											Lewistown	2,504	
											Lockport	2,659	
ESTIMATED COST													
Central Equipm't	$1,800,000												
Subscribers "													
Building	150,000												
Conduits	750,000												
Armoured Cables	1,106,280												
Manholes	138,000												
Engineering Exps	300,000												
Contingencies	150,000												
Distributing, &c	1,080,000												
Total	$5,474,280			$152,065			$91,238			$45,619			$24,360
Capitalization per Phone	61			61			61			61	Marengo	2,005	
											Marion	2,510	
											Marseilles	2,559	
											Marshall	2,077	
											Mascoutah	2,171	
											Maywood	4,532	
											Melrose Park	2,592	
											Mendota	3,736	
											Metropolis	4,069	
											Minonk	2,545	
											Momence	2,026	
											Morgan Park	2,329	61
											Morris	4,273	
											Morrison	2,308	
											Mound City	2,705	
											Mount Carmel	4,311	
											Mount Olive	2,935	
DEPRECIATION													
Conduits, 3%	$108,720												
Other Plant, 6%	105,000												
Total	$213,720			$5,940			$3,562			$1,781			$960
											Naperville	2,629	
											Nashville	2,184	
											Normal	3,795	
											North Peoria	2,358	
											Olney	4,260	
											Paxton	3,036	
											Petersburg	2,807	
											Pinckneyville	2,357	
											Pittsfield	2,293	
											Pontiac	4,266	
											Princeton	4,023	
											Rochelle	2,073	
											Rockfalls	2,176	
											Roodhouse	2,351	
											Rushville	2,292	
											Sandwich	2,530	
											Savanna	3,325	
											Shelbyville	3,546	
											Sparta	2,941	
											St. Charles	2,675	
											Staunton	2,786	
											Sullivan	2,399	
EXPENSES													
Engineer and Manager	$45,000												
Assistants	21,600												
Sec.-Tr. and Bookkeepers	27,000												
Storekeepers	10,800												
Stenographers	28,800												
120 Inspectors @ $720	86,400												
Heat, Light, &c	30,000												
Total	$249,600			$6,950			$4,160			$2,750			$1,500
											Sycamore	3,653	
											Taylorville	4,248	
											Toluca	2,629	
											Tuscola	2,569	
											Upper Alton	2,373	
											Vandalia	2,665	
											Venice	2,450	
											Virden	2,280	
											Warsaw	2,335	
											Waterloo	2,114	
											Watseka	2,505	
											West Hammond	2,935	
											Wheaton	2,345	
SUMMARY											Whitehall	2,030	$4,500
Revenue	$1,050,000			$29,000			$17,500			$8,750	Wilmette	2,300	1,948
8% on Capital	437,492			12,165			7,299			3,650	Woodstock	2,502	960
Depreciation	213,720			5,940			3,562			1,781		287,934	1,500
Expenses	249,600			6,950			4,160			2,750			
Surplus	148,738			3,945			2,479			569			92

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN ILLINOIS

Faller Automatic Operator. ALL LINES UNDERGROUND.

Over 1,000, under 2,000

TOWNS		Proposed Plant	TOWNS		Proposed Plant
Name	Pop.	Acc't	Name	Pop.	Acc't
Albion	1,162		National St'k Yds	1,000	
Altamont	1,335		Nauvoo	1,321	
Amboy	1,826	75	Neoga	1,126	75
Arcola	1,995	125	Newman	1,166	125
Arlington H'ghts	1,380	15	Newton	1,630	15
Ashland	1,201	10	Niwood	1,378	10
Assumption	1,702	½m.	Nokomis	1,371	½m.
Astoria	1,684		North Chicago	1,150	
Athens	1,535		North Utica	1,150	
Atlanta	1,270	100	Oakland	1,198	100
Auburn	1,281		Odell	1,000	
Augusta	1,149		Odin	1,180	
Averyville	1,573		O'Fallon	1,267	
Barrington	1,162		Olgesby	1,000	
Barry	1,643		Ornaga	1,270	
Bemes	1,484		Orquawka	1,010	
Benton	1,341		Oregon	1,577	
Braceville	1,669		Palatine	1,020	
Bradley	1,518		Park Ridge	1,430	
Breese	1,571		Pecatonica	1,045	
Brooklyn	1,019		Peotone	1,003	
Bunker Hill	1,378		Piano	1,634	
Byron	1,015		Polo	1,869	
Cambridge	1,345		Prophetstown	1,143	
Camp Point	1,260		Rantoul	1,207	
Carbonhill	1,252		Redbud	1,169	
Carlyle	1,874		Ridgely	1,169	
Carpentersville	1,002		River	1,539	
Cartersville	1,749		Riverside	1,551	
Casey	1,500		Riverton	1,511	
Cerrogordo	1,008		Robinson	1,683	
Chatsworth	1,038		Roseville	1,014	
Chenoa	1,512		Rossville	1,435	
Chillicothe	1,699		Salem	1,642	
Cobden	1,034		Sandoval	1,258	
Colchester	1,635		Seneca	1,030	
Colfax	1,153		Shawneetown	1,698	
Columbia	1,197		Sheffield	1,265	
Cuba	1,198		Sheldon	1,103	
Delevan	1,304		Sorento	1,000	
Des Plaines	1,666		St. Anne	1,000	
Dolton's Station	1,229		St. Elmo	1,050	
Earlville	1,122		Sumner	1,268	
East Dubuque	1,146		Toulon	1,057	
Edinburg	1,071		Trenton	1,706	
Eldorado	1,445		Troy	1,080	
Elmhurst	1,728		Utica	1,150	
Elm Wood	1,582		Vermont	1,195	
		$12,180			$12,180
Elpaso	1,441		Vienna	1,217	
Eureka	1,661		Virginia	1,600	
Farmer City	1,664		Warren	1,327	
Farmington	1,729		Washington	1,459	
Forreston	1,047		Waverly	1,573	
Fort Sheridan	1,575		Wenona	1,496	
Freeburg	1,214		West Chicago	1,877	
Gardner	1,036		Wilmington	1,420	
Gilman	1,441		Winchester	1,711	
Girard	1,661		Winnetka	1,833	
Glen Carbon	1,350		Winstanley	1,055	
Germantown	1,782	61	Wyoming	1,277	61
Glencoe	1,020			228,090	
Golconda	1,140				
Genoa	1,140				
Grayville	1,948				
Greenfield	1,085				
		$480			$240
Greenup	1,085		Addison	591	
Greenview	1,019		Albany	729	
Griggsville	1,404		Alexis	915	
Grossdale	1,111		Algonquin	550	
Hamilton	1,344		Altona	633	
Hawthorne	1,000		Alto Pass	518	
Henry	1,637		Antioch	522	
Herrin	1,559		Apple River	576	
Highland	1,970		Argenta	525	
Hillsboro	1,937		Arthur	858	
Homer	1,080		Ashley	953	
Jonesboro	1,130		Ashton	756	
Kangley	1,004		Atkinson	762	
Kansas	1,049		Atwood	698	
Keithsburg	1,566		Ava	984	
Kirkwood	1,008		Avon	809	
Kinmudy	1,221		Beechwood	854	
Knoxville	1,857		Bellmont	624	
Lacon	1,601		Bethany	873	
Ladd	1,324		Blandinsville	995	
Laharpe	1,591		Bluemond	714	
Lanark	1,306		Bluffs	539	
		$863			$400
Lawrenceville	1,300		Bourbonnaise	595	
Lebanon	1,862		Bowen	528	
Lena	1,252		Bradford	773	
LeRoy	1,629		Brighton	660	
Lexington	1,415		Brimfield	677	
McHenry	1,013		Brocton	613	
McLeansboro	1,758		Brooklyn	865	
Madison	1,979		Brookport	865	
Marissa	1,080		Buda	873	
Martinsville	1,213		Buffalo	531	
Mason City	1,000		Bureau	545	
Milford	1,800		Cabery	538	
Millstadt	1,077		Cable	697	
Monticello	1,172		Capron	502	
Mount Carroll	1,982	$2,375	Catlin	697	$1,150
Mount Morris	1,965	975	Central City	615	487
Mount Pulaski	1,048	480	Chadwick	505	240
Mount Sterling	1,643	863	Chandlerville	940	400
Moweaqua	1,960	57	Chapin	514	33
	1,478		Chatham	629	

Over 500, under 1,000

TOWNS		Proposed Plant	TOWNS		Proposed Plant
Name	Pop.	Acc't	Name	Pop.	Acc't
Chebansee	555		Morton Grove	564	
Cissna Park	623		Mulberry Grove	682	
Clarke City	621	30	Nebo	508	30
Clay City	907	70	New Athens	856	70
Christman	905	15	New Baden	510	15
Clayton	996	10	Neponset	516	10
Clifton	652	½m.	New Berlin	533	½m.
Coffeen	963		New Boston	703	
Cornell	521		Niantic	654	
Coulterville	650	100	Niles	514	100
Cowden	751		Niles Center	529	
Creal Springs	940		Noble	597	
Crete	760		Norris City	868	
Crossville	523		North Alton	904	
Crystal Lake	950		North Aurora	500	
Dallas City	970		Nunda	604	
Dawson	574		Oblong	743	
Danvers	607		Okawville	544	
DeSoto	560		Omaha	569	
Diamond	672		Onelda	785	
Dongola	671		Orion	584	
Durand	571		Oswego	615	
East Galesburg	663		Palestine	979	
East Peoria	899		Palmyra	813	
Elburn	606		Patoka	640	
Elizabeth	659		Pawnee	595	
Elizabeth Town	663		Pawpaw	765	
Elkhart	553		Pearl	722	
Enfield	971		Pelonia	865	
Equality	978		Percy	660	
Erie	768		Perry	642	
Evansville	663		Philo	502	
Fairmont	928		Piper City	577	
Fairview	501		Plainfield	930	
Farina	693		Pleasant Plains	575	
Fisher	614		Plymouth	854	
Flanagan	509		Port Byron	732	
Forrest	952		Potomac	764	
Franklin	687		Prairie City	818	
Franklin Grove	681		Princeville	735	
Gages Lake	642		Ramsey	747	
Georgetown	988		Randall	663	
Germantown	665		Rankin	754	
Gifford	700		Raymond	906	
Gillespie	873		Richmond	576	
Glen Ellyn	793		Ridgefarm	933	
Golden	516		Ridgway	839	
Grafton	988		Riverdale	558	
		$6,090			$6,090
Grand Tower	881		Roanoake	966	
Grape Creek	610		Rockbridge	588	
Gridley	716		Rockton	936	
Gross Point	669		Rutland	893	
Hampshire	760		Saybrook	879	
Hanover	785		Schaumberg	575	
Hennepin	523		Seatonville	909	
Hebron	611		Shabbona	706	
Heyworth	683		Shannon	678	
Highwood	750		Sherrard	826	
Hinckley	587		Sidell	776	
Hopedale	600		Sidney	564	61
Hume	598	61	Somonauk	630	
Huntley	606		South Danville	868	
Hutsonville	748		South Egin	515	
Illiopolis	744		South Holland	766	
Ipava	749		So. Wilmington	711	
		$240			$240
Irving	675		St. Francisville	591	
Johnston City	787		St. Joseph	637	
Johnstown	787		Stanford	601	
Kane	588		Steelevllle	562	
Kenney	584		Steeger	712	
Kingston	509		Stewardson	677	
Kingston Mines	508		Stockton	946	
Kirkland	636		Stronghurst	762	
LaGrange Park	730		Summit	547	
Lake Creek	787		Swansea	735	
Lamoille	576		Tallula	639	
Lansing	830		Tamoroa	853	
Leaf River	507		Tampico	807	
Leland	634		Thornton	600	
Libertyville	864		Tiskilwa	965	
Loda	668		Toledo	818	
Lombard	590		Tolono	845	
London Mills	528		Towerhill	615	
Louisville	648		Tremont	768	
Lovington	815		Versailles	524	
Lyons	915		Villaridge	500	
McLean	532		Viola	552	
		$400			$400
Mackinaw	859		Wainut	791	
Macon	705		Warrensburg	503	
Mahomet	515		Washburn	703	
Makanda	528		Wataga	545	
Malta	507		Wayne City	522	
Manito	561		Waynesville	528	
Mansfield	708		Weldon	536	
Manteno	932		Western Springs	662	
Marine	666		Westfield	820	
Marysville	764		West Freeport	724	
Melvin	550		West Salem	700	
Mendon	627		West Spridgfield	668	
Meredosia	700		Westville	605	
Metamora	758		Williamsville	573	
Milan	719	$1,150	Windsor	866	$1,150
Milledgeville	633	487	Woodhull	774	487
Millshoals	669	240	Worden	544	240
Minier	746	400	Wyanet	902	400
Morrisonville	934	23	Xenia	800	23
Morton	894		Yates City	650	
			Yorkville	840	179,552

To the Managers and Owners of Independent Telephone Companies in Illinois.

In association with
T. C. E. Blanchard,
Fred. C. Blanchard,
W. W. Blanchard,
W. P. Huribut,
James S. Clarkson,
Charles A. Towne,
Augustine W. Wright,
Fritz Loeffler,
Coker F. Clarkson,
Geo. L. Lavery,
Albert G. Welch and
Frank H. Sellers,

I have formed and incorporated the Rogers Telephone Company for Illinois. There will be others in association, but we shall not now give their names.

This account shows how for new work the telephone can be standardized.

Everyone knows how I have stood for the Automatic Operator.

It gives me great pleasure to see that my good opinion of Kempster B. Miller is now justified. Mr. Miller's paper read at the International Electrical Congress at St. Louis certainly shows that he has no false pride, and is seeking the right way.

Even the conventional expert is last tending towards the certain fact of automatic exchanges. The Strowger is doing business so fast that even the fearsome are trying to make people believe that they have always favored the automatic.

The Faller will soon be doing business, and there is room for it. Time will settle the question of superiority.

Long before you will be called upon to change to the Automatic Operator you will need to join with your neighbor on toll lines and so present a united front to the Bell. It is now making desperate efforts to get your customers away from you, urging that it alone can give long distance service.

The Rogers Telephone Company for Iowa has selected Fayette County and the adjoining counties, as a place to amalgamate the Independent Companies, as an example:

FAYETTE COUNTY, IOWA

INDEPENDENTS:	Mileage	Instruments.
U.S. Telephone Co	123	
Summer " "	93	
Interstate " "	38	
Standard " "	14	
Buchanan " "	11	
Home " "	10	
Pleas'nt R'ge " "	10	
Protovin " "	2	
Henderson " "	4	
Total	305	
Bell "Monopoly"	152	

The Bell has only about one-third the instruments compared to the Independents.

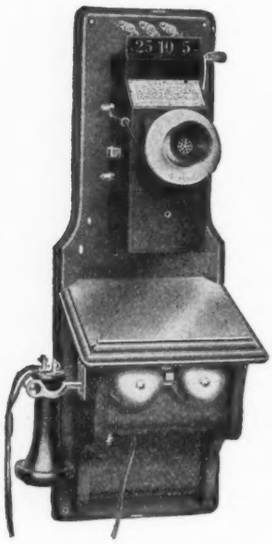
We think it adviseable for the Independents to combine. The Rogers Telephone Company has combined over two-thirds of the Independent mileage in Fayette County and will get every mile in against the Bell. We have the improvements to help the Independents and we will help every honest Independent—proving out the matter at my home. Watch the West Union and Fayette county papers.

Oscar Wentworth Rogers.

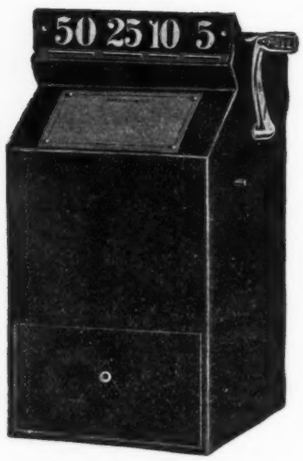
Aug. 20, 1904.

BAIRD PAY STATIONS EARN DIVIDENDS

One method of mounting



No. 136 Pay-Station



No. 14 Pay-Station

No. 24 Pay-Station

Pay telephones are patronized in proportion to the convenience of their location. Each pay-station will create a patronage of its own. Don't neglect or overlook this immensely important feature of the business.

BAIRD MANUFACTURING CO., 3 Michigan St., Chicago

DOUBLEDAY-HILL ELECTRIC CO.

MANUFACTURERS AND DEALERS

ELECTRICAL SUPPLIES

PITTSBURG, PA.

Complete Line of Telephone Construction Material.

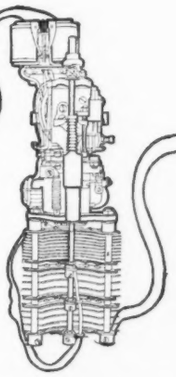
QUICKEST DELIVERY, HIGHEST GRADE, LOWEST PRICES.

If in need of TELEPHONES "connect up" and let us talk it over together. While we are only one of many, the "Williams" is *the one* you should investigate.

WE OPERATE A FACTORY NOT A REPAIR SHOP

The Williams Telephone & Supply Co., 73-79 Central Ave., Cleveland, O.

Please tell the Advertiser you saw his Announcement in TELEPHONY.



THE POSSIBILITIES OF AUTOMATIC TELEPHONY

are strikingly demonstrated by the equipments we have installed in the cities named below and in our working exhibit at the St. Louis World's Fair, Section 24, Palace of Electricity.

We have installed there two complete Automatic Telephone Exchanges of the 10,000 type, each having 100 stations.

Ours is the only perfect working, absolutely Automatic Telephone System, adaptable to any size exchange, that has been adopted and is in general use in this or any other country. It has long since passed the "trying-on" stage and when you buy our system you invest your money in experience, not in experiments. Our system is rapidly being adopted by progressive Independent Telephone Companies to replace manual boards and is proving profitable to the operating companies, and satisfactory to the patrons.

Among the principal places where it has been adopted are:

Chicago, Ill.
Grand Rapids, Mich.
Columbus, Ohio.
Dayton, Ohio.
Lincoln, Neb.
Portland, Maine.
Auburn. N. Y.
Lewiston, Maine.
Auburn, Maine.
New Bedford, Mass.
Los Angeles, Cal.
San Diego, Cal.
Hopkinsville, Ky.
Sioux City, Iowa.
Cleburne, Texas.
Traverse City, Mich.
Columbus, Ga.
Augusta, Ga.
Medford, Wis.
St. Mary's, Ohio.
Woodstock, N. B.
Westerly, R. I.
Manchester, Iowa.
Princeton, N. J.
Albuquerque, N. M.
Fall River, Mass.
Van Wert, Ohio.
Battle Creek, Mich.
Clayton, Mo.
Pentwater, Mich.
Toronto Junction, Canada.
Riverside, Cal., and
Berlin, Germany.

You are cordially invited to inspect our exhibition exchange at the World's Fair. It will be well worth your while. If you cannot do so, write to us for information.

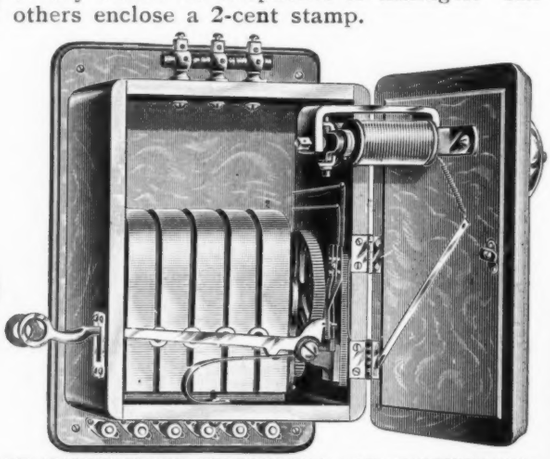
AUTOMATIC ELECTRIC COMPANY,
CHICAGO, U. S. A.

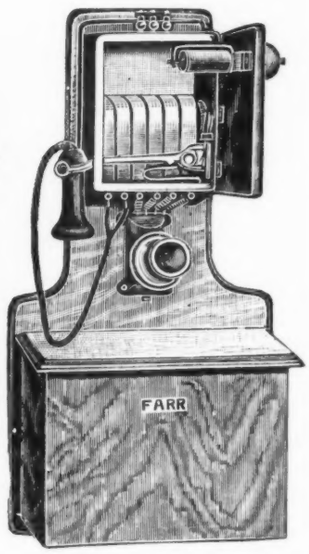
OUR NEW CATALOGUE No. 17

FIVE HUNDRED ILLUSTRATIONS, CONTAINS THE FOLLOWING:

How to Build Telephone Lines, How to Install Telephones, Faults in Telephones—How to Remedy, Induction Explained, Weights and Resistance of Wires, Estimate of Material for Exchange of Fifty Telephones, Methods of Connecting Repeating Coils, Diagrams of Bridged and Series Telephones, Condenser for Telephone Shunt, Wiring of Transmitter Arm Base and Induction Coil, How to Wire Line to Fuse Block.

Catalogue Sent Free to any owner of telephones or manager. All others enclose a 2-cent stamp.





WE MANUFACTURE TELEPHONES AND SWITCHBOARDS

A full line of Telephone Supplies, Linemen's Tools. Prices the lowest. Brackets, Glass Insulators, Cross Arms, Pins, High Grade Galvanized Iron Wire.

FARR TELEPHONE AND CONSTRUCTION SUPPLY CO., 118 AND 120 WEST JACKSON BLVD., **CHICAGO**

Yes, a Telephone on Thirty Days' Trial!

We know words can't describe the efficiency and beauty of this instrument; therefore, we are willing to let you see it, because it can then be better appreciated. The woodwork is of handsome design and finish. The generator, transmitter and receiver are mechanically perfect, and electrically correct, and our guarantee on this instrument goes on forever. It is not simply a guarantee for a week, a month or a year, but at any time after you have purchased this instrument we will replace any part that should prove defective, when operating under proper management and normal conditions.

Isn't this a pretty clever offer? We will send it on trial, free. Examine it, test it, and then if we are not correct in our statements, send it back and we will pay the charges. Our prices are right too.

Ewing-Merkle Electric Company,

St. Louis, U. S. A.

THROWING BOUQUETS AT OURSELVES

Aurora, Ind., Aug. 8, 1904.

"I like the new switchhook, and think it a very strong and secure mechanism."

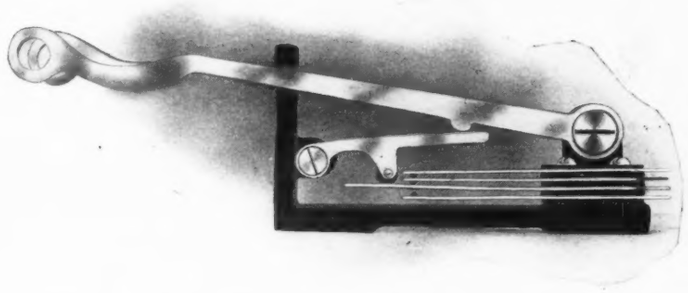
Southern Indiana Telephone Association

E. W. Swarthout, Secretary.

New Western Switchhook

Perfect Apparatus

No Trouble



No Repairs

Reasonable Prices

The Best Switchhook Made

The Voice of the States.

KANSAS

Turin Telephone Co., Turin, Kansas.

"I am proud of your phones. They are all you claim for them."

G. H. Goodenough.

ILLINOIS

Eureka Telephone Exchange Co., Eureka, Ill.

"We have some of the old Western Bridging phones. Been used six years and we think them about as good as any."

INDIANA

C. W. Cook, Carmel, Ind.

"The phones of yours here are giving entire satisfaction. I am pleased."

IOWA

A. G. Gary, Walker, Iowa.

"I ordered seven phones last spring. They are all giving perfect satisfaction."

MICHIGAN

Ed. Osterhout, Dundee, Mich.

"The transmitters that I got from you work fine. I think them better than the Bell."

COLORADO

Knowles & Barrett, Eastonville, Colo.

"We are placing your phones alongside the Bell, and everybody praises yours."

WASHINGTON

C. F. Sawyer, Palouse, Wash.

"There is but one of your phones in this neighborhood, but it is the pride and talk of the country."

OKLAHOMA

Geary Telephone Co., Geary, Ill.

"The Western transmitter is the best I have ever seen. There is nothing wrong with the receiver either. I put them on an old phone and talked to the end of the line with ease."

Horace Truman, Mgr.

And we have hundreds of others.

Western Telephone Manufacturing Company

CHICAGO, ILLINOIS

"The Pioneer Independent Telephone Factory"

Please tell the Advertiser you saw his Announcement in TELEPHONY.

A Telephone Company

is known by the apparatus it uses. The majority of the largest and most successful independent exchanges in the country have adopted

Kellogg Telephone Apparatus

as "Standard." Write for our latest catalogues and further particulars of our products.

Kellogg Switchboard & Supply Co.

Green and Congress Streets, Chicago

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Why Need You Hesitate

as to what make of telephone apparatus to use when the leading experts and engineers the world over have decided for you that

Kellogg Telephone Apparatus

is by far the best. The finest raw material, the best workmanship, most careful design and thorough inspection of finished product are some of the reasons why.

Kellogg Switchboard & Supply Co., Chicago

Seymour Building
Los Angeles

Keystone Telephone Building
Philadelphia

Electric Building
Cleveland

Please tell the Advertiser you saw his Announcement in TELEPHONY.

ARE YOU SATISFIED

with the results obtained from your present equipment?

NO

Then let us tell YOU why YOU should get in line NOW, and adopt EUREKA APPARATUS. We have satisfied over Three Thousand Companies; have MADE more SWITCHBOARDS than any other manufacturer. Experience teaches, don't it? WE KNOW HOW.

SOME NEW THINGS

FULLY DESCRIBED IN OUR NEW
NO. 33 CATALOGUE
READY FOR DISTRIBUTION

Write us. And do it now.

EUREKA ELECTRIC CO.

Makers of Everything Needed to Equip a Telephone Exchange.

Factory and General Office, **GENOA, ILLINOIS.**

Sales Department, Monadnock Block, **CHICAGO.**

"Independent Telephone Practice" for the asking.

Results Count You get them with the "1900" Dry Battery

Send a Trial Order to the Nearest Dealer, or Telephone Manufacturer

NUNGESSER ELECTRIC BATTERY CO., Cleveland.
General Sales Office: 128 West Jackson Boulevard, CHICAGO.

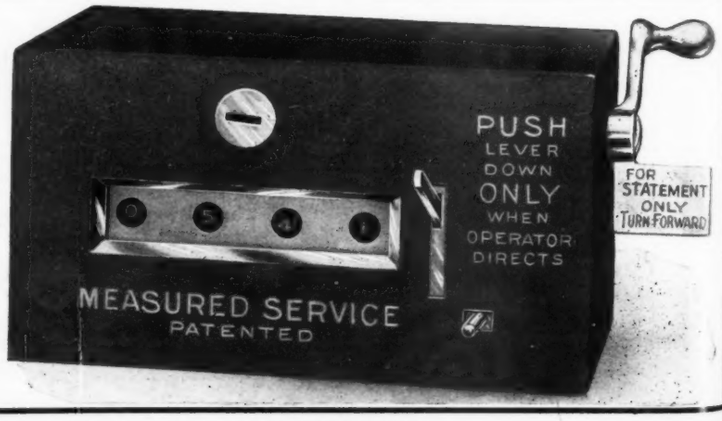
Have You Seen the
Meter for Measured Service?

The only meter in the world that takes the statement from the Central Office. No extra wiring or other apparatus required. Can be used over any length of wire or with any system, trunk or party lines.

Positive, Strong and Accurate.
A Money Saver and a Money Maker.

Write for descriptive circulars.

Measured Service Company,
153 So. Jefferson St., Chicago.

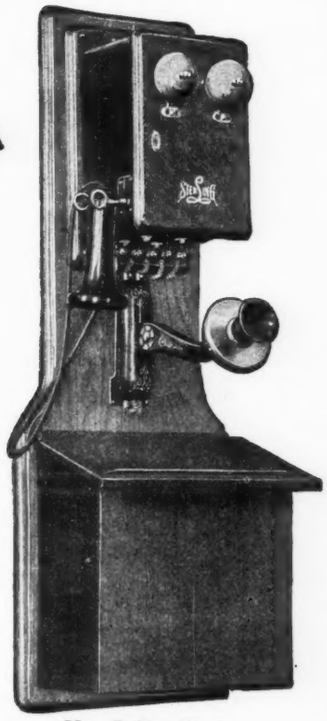


Please tell the **Advertiser you saw his Announcement in TELEPHONY.**

FOUR OF A KIND

HARD TO BEAT

No. 16 Sterling



No. 5 Sterling

No. 118 Sterling

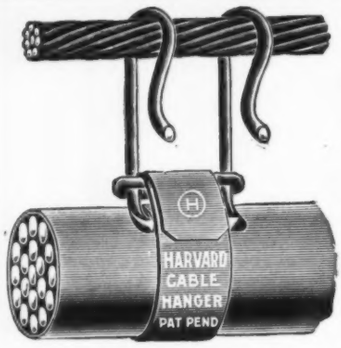
No. 8 Sterling

WE HAVE OTHERS

Write us for a full deck with prices and descriptions.

STERLING ELECTRIC CO.

LAFAYETTE, INDIANA



No. 94—Prices Reduced.

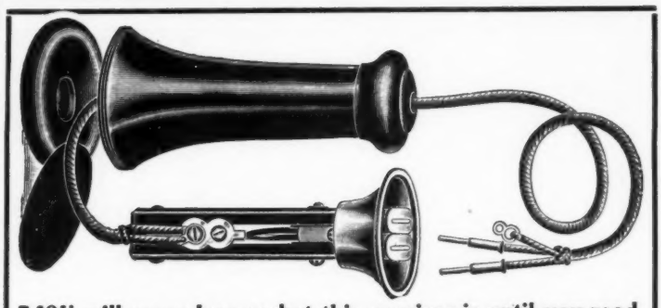
Harvard Cable Hangers

DOUBLE GRIP

Write to-day for free copy of our mammoth protector catalog.

Harvard Electric Company

224-226 S. Clinton St.
CHICAGO



YOU will never know what this receiver is until you read our descriptive circular which we will send on application

Novel Features Combined with Best Workmanship, at a fair price. Write

SPIES ELECTRIC CO., Mfrs., 81 W. Van Buren St., Chicago, Ill.

By their talking qualities, they speak for themselves.

"Wesco" Telephones and Switchboards

Are guaranteed to give perfect satisfaction. We carry in stock everything necessary for the construction and maintenance of telephone lines. Write for our new No. 60 catalog and price book.

The Wesco Supply Co., St. Louis, Mo.

Edward E. Clement

ATTORNEY AND COUNSELOR IN PATENT CAUSES

Solicitor of American and Foreign Patents

TELEPHONE & ELECTRICAL EXPERT

McGill Building, 908 G Street

WASHINGTON, D. C.

THE H. B. CAMP CO.

Manufacturers of

"CAMP" STANDARD VITRIFIED CLAY CONDUITS.

SALES OFFICES:

85 Hartford Bldg. CHICAGO

170 Broadway NEW YORK

First Growth and Quality, Round or Unbled Southern Yellow Pine.

CROSS ARMS

FROST CROSS-ARMS contain elements of durability that resist all other elements.
WRITE US FOR REASONS.

FROST CROSS ARM & LUMBER MFG. CO.

Mills in North and South Carolina. General Offices, Cleveland, Ohio.

R. W. KEMP

Consulting & Contracting Telephone Engineer

Kansas, Oklahoma and Indian Territory.

Plans and Estimates for Old and New Plants

Wellington, Kans.

Old Systems overhauled and placed on paying basis

Standard Underground Cable Co.

Pittsburg. Boston. New York. Philadelphia. Chicago. San Francisco.

BARE AND WEATHERPROOF COPPER WIRE AND CABLES.

RUBBER INSULATED WIRE AND LEAD COVERED CABLES.

WE FURNISH, INSTALL AND GUARANTEE EVERYTHING CONNECTED WITH TELEPHONE WIRE AND CABLE AND ACCESSORIES.

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. VIII. CHICAGO, OCTOBER, 1904. No. 4.

Proceedings of National Convention

INDEPENDENT telephone men from all parts of the country made St. Louis their mecca on September 21, 22 and 23, when the Independent Telephone Association of the United States held its eighth annual convention on the Exposition grounds in that city. The convention headquarters were at the Inside Inn, where the several sessions were also held. The attendance of representative workers from the operating field was satisfactory in every particular, while the Independent manufacturers and supply men were represented in large numbers. All the deliberations were marked with enthusiasm and altogether it was the most important, as well as the most successful, gathering ever held by the national association, as the ultimate outcome of which great and lasting good should result.

As an indication of the deep interest taken by those present in all the proceedings, it is only necessary to state that a majority of the delegates remained during the entire three days of the convention and took more or less of an active part in all the deliberations of the association. The various sessions were largely attended and the papers which were read caused wide discussion. That they were practical was generally conceded. The keynote of the meeting was "Better organization in all departments of Independent telephony," looking toward united action on the part of the Independents from one end of the country to the other, and a still greater and more effective onward movement.

JAMES B. HOGE.

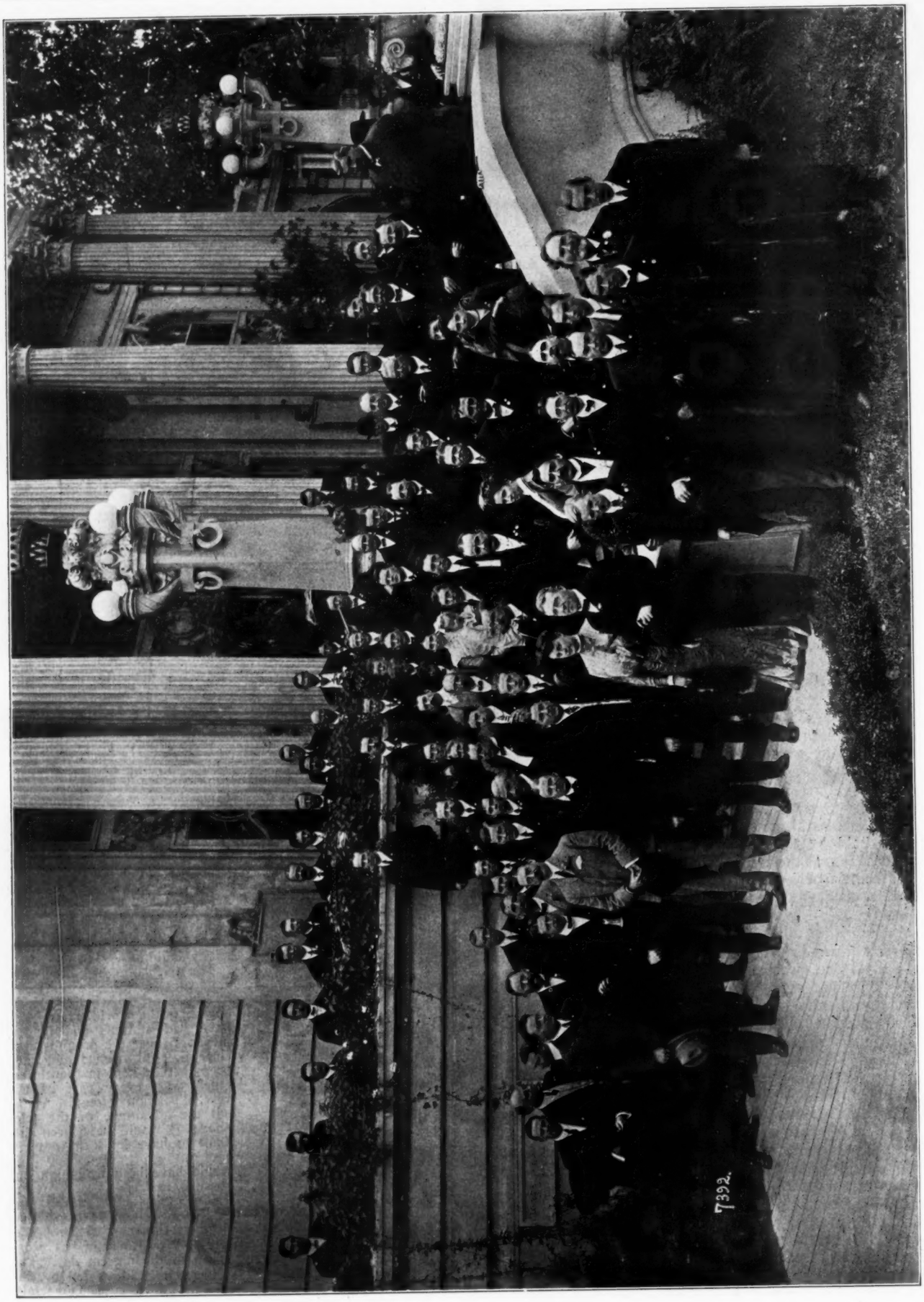
WEDNESDAY, SEPTEMBER 21.

The opening session of the convention was called to order at 10 a. m. by President Hugh Dougherty, with F. G. Jones officiating as secretary. President Dougherty made a few appropriate remarks and got down to business at once by introducing Prof. W. E. Goldsborough, chief of the department of electricity at the world's fair, who in behalf of President Francis and the exposition welcomed the delegates and spoke of the electrical features of the fair. Following is a summary of his remarks:

The Louisiana Purchase Exposition is peculiarly adapted to a convention of men engaged in the business of employing electricity for the benefit of mankind. We have welcomed many congresses, embodying electrical organizations from all parts of the country, and during the past week we welcomed the great International Electrical Congress, and many affiliated bodies. This week we welcome you, and for your instruction and entertainment we have many interesting telephone features on exhibition in the Electricity building.

The telephone has been preeminently a valuable assistant in the work of building and operating the world's fair. We have had stations and instruments all over the grounds ever since the fair opened and have been thereby kept in the closest touch with every part of the vast exposition grounds. Without the advantage of the telephone, it would have been difficult to have built or to manage this great exposition. It would have been well nigh impossible, in fact.

Our telephone exhibit includes a complete operating branch exchange of the Kinloch Telephone Company of St. Louis, as well as various exhibits of apparatus. We also show the progress of the art from its beginning down to the present day. The interesting subject of automatic development is illustrated by fine exhibits of automatic manufacturers. The fair is a telephone fair, and it bids you all welcome.



GROUP OF DELEGATES ATTENDING THE EIGHTH ANNUAL CONVENTION NATIONAL INDEPENDENT TELEPHONE ASSOCIATION, ST. LOUIS, SEPTEMBER 21-23, 1904.

A vote of thanks was extended Prof. Goldsborough and through him to President Francis for the cordial welcome extended.

President Dougherty next read his annual address, which follows in full:

One of the characteristics of this wonderful age in which we are living is its convention spirit. Nearly every organization, secret and otherwise, holds its convention at stated intervals for the advancement of its interests. Such is the magnitude of some of these conventions that the larger cities, even the states and nations, vie with one another for the privilege and honor of entertaining them. However, it is not always the largest convention nor the most enthusiastic that results in the most good to the people who are interested in the subjects to be considered. Therefore, if we lack in numbers to-day we hope that we will not lack in fealty to one another and to the interests we represent; so as we take up the sacred burdens laid upon us by the people who have placed their trust in our care, we should reverently and joyfully bear them on to triumph and unitedly bring about results that would benefit all the people, including the manufacturer, operator and patron. This will require patience, judgment and perseverance, which are the essential elements in the achievement of great success, and without exercising these nothing great can be accomplished.

The operator must concede a reasonable profit to the manufacturer, the user of the telephone must do likewise to the operator, and the manufacturer must be fair to the patrons, through his treatment of the operator, by giving apparatus of the best class at reasonable prices. So each owes a duty to the other, and selfishness should not be the dominating spirit in our deliberations, or after them, into the practical operation of our business. To emphasize this thought I repeat what was aptly said by another: "The farmer who shears the fleece and cares not for the sheep has no reason to complain that his flock does not thrive." So the manufacturer who bears down too hard upon the operator may expect slow and doubtful collections, which would indicate lack of thrift on the part of his patrons, and the operator who gives poor service or makes extravagant charges will find his flock scattered.

The world is sustained by four things only—the learning of the wise, the justice of the great, the prayers of the good, and the valor of the brave. Many have been the victories of the Independent telephone users since the first convention eight years ago. While my heart is filled with joy over these successes in the expansion of the business, in our litigations with the Bell Telephone Company on account of the Berliner patents and other inventions, and the very pleasant associations with the advisory board, and especially the committee on litigation, composed of Judge J. M. Thomas, Hon. S. P. Sheerin, Hon. H. D. Critchfield, Hon. E. B. Fisher, and myself, yet my heart is sad to know of the serious illness of my predecessor, as president of this association, and who was one of the committee. He was never idle when the interests of the Independent telephony were in danger, cheerfully giving up time, money, and even pledging his credit to a large degree that the Independent users of telephones might be protected against the Bell company's efforts to destroy their rights in the United States courts. No more faithful servant of you people ever lived, always untiring, ever wise, and therefore successful in every effort he made in protecting your rights. It is sad, indeed, to know of the serious illness of such a man, but he has built a monument more to be appreciated than granite or marble, for he has given through you, the manufacturers and operators, to the people of the United States, the use of the telephone, a thing of universal benefit and profit, at prices that can be reached by every one, which was not true while the patents were under the control of the parent company.

We cannot yet foretell the mission of this great invention, the telephone, for it is far reaching in its effect. I am sure it is no disparagement to its wonderful growth to say that it is yet a child in growth, with its future all before it. This great carriage which transmits our thoughts through space is bound to develop the mind by its activity and contact in such a multiplicity of ways that the genius will use it to develop many useful inventions, not yet dreamed of, for the benefit of man.

So we are not here to-day to criticise or condemn any one who is in any way connected with the telephone, as an inventor, promoter, manufacturer or operator, for all of them played their part in serving the people well, and we should never cease to sing their praises. After years of experience the Independent telephone people of this country, like all other benefactors, will lose their hold on the minds and affections of the people when they become a mere business proposition, and must meet the public expecting to be treated the same as all other competitors for business. However, there should continue to be a fealty between Independent operators that should hold them together and cause each to have the sympathy and aid of the other. This does not, however, always prevail even at this early stage.

In some instances it has been observed that one Independent company would try to drag down another Independent company, out of jealousy, by criticisms to the public and praise to the assessor; the one to take away business, the other to increase the expense account. This has been noticeable in my own state, and I understand that it prevails to some degree in other states. We have reached a point, as Independent telephone operators, where a better understanding must exist between the operators. We must become more of one mind, and therefore we must become as one institution. Our apparatus and construction should be better balanced and we must take better care of the public. I hope this criticism will not be understood as a reflection on the Independent operators, for, as a whole, no class of business men is more deserving, and as business promoters and managers none stands higher in the estimation of financiers. Their securities have become a boon to the investor and as time goes on, telephone bonds will become more and more stable, until they occupy the forefront of all industrial securities.

As before indicated, the telephone is yet a mere child, to be nurtured into manhood by paternal kindness, conciliation and co-operation. It belongs to the operators to join together their energy and their capital and prepare for better service, both in the exchanges and toll service. But there is especially a necessity for this action as applied to the long distance telephone lines. They must reach out and connect with great cities. I am pleased at the suggestion, as well as the effort that is being put forth, for the betterment of the long distance telephone service.

It seems fitting that our convention should be held in this city, within the grounds of this great exposition, which commemorates the Louisiana purchase, an event taking place at about the same period as the organization of Indiana Territory, under the administration of Thomas Jefferson, so that the Indiana Territory organized and Louisiana Territory acquired, by purchase under Jefferson's administration in 1803, were acts of importance to this country and the foundation upon which the greatest nation on earth has builded. Therefore, no more appropriate thing could transpire than that the National Telephone Association of the United States of America should join in this celebration by holding its convention within these grounds, for through the victories of General Clark, and the statesmanship and diplomacy of Jefferson and Chief Justice Jay, all the territory northwest of the east line of Indiana was added to our possessions early in the nineteenth century, and the invention of the telephone was among the greatest achievements in the closing of that century, making these two events the Alpha and Omega of the greatest century in the history of the world.

In natural resources there is no territory greater than that covered by the Louisiana purchase, much of it in the richest valley in the world, with the advantages of unfailing seasons (there are no failures of crops in this valley), and more than once she has been the Egypt to the famine stricken in our own and other countries. Penetrated as it is by the tributaries of the Mississippi river and crossed by the great trunk line railroads of the country, make it the heart of the nation, whose outgoing arteries of commerce nourish every part of our national body.

As great as has been the nineteenth century, and the events during its existence, the greatest of all is the exposition which is to the credit of the enterprising citizens of St. Louis. It has never been surpassed in this country or any country in grandeur, beauty, architecture, art, landscape or magnitude. It far exceeds the Centennial at Philadelphia, the World's Fair at Chicago, or the Pan-American Exposition at Buffalo, and I hope no citizen in the United States who is able to reach here will fail to visit this, the grandest of all expositions.

In the absence of Prof. J. C. Kelsey his paper on "What Telephone Engineering Needs" was read by Secretary Jones, as follows:

Our country has visibly increased in wealth and power, and has grown more just and normal in the last three decades than in the centuries preceding. The cause is plain, primarily these, rapid, efficient and comfortable transportation, good light and ease in communication. Transportation is a powerful factor in production of wealth, for it brings the raw material to the mills and distributes the finished product to all parts of the world. It is also a factor in peace or war, for ready mobilization of troops insures freedom from invasion, and the constant association and intermingling of people from all parts of our country renders like ideals, and reduces the possibility of discord and rebellion. It brings into competition all people's ideas, and an improvement of nature's forces is inevitable. The lighting of darkened streets has reduced crime, and publicity, the child of communication, has insured justice and equality to the citizen.

Of these three potent forces, communication has been the least developed; and from an electrical standpoint, communication is one of the oldest members of the group. Yet, if one should look through the files of an electrical magazine a few years back, he will see professional cards of engineers engaged in street railway and electric lighting work. But not one telephone or telegraph engineer. Surely there were some, for who helped in the gradual perfection of telephone apparatus? Where were they? If any telephone exchange office had been visited a few years ago, the telephone engineer would have been found in a dingy cellar, with a pair of spurs by his side, and work enough on hand to keep him busy until midnight. No wonder the engineering profession at large did not hear from him, because he was too busy to talk, or even write. So the electrical profession got it into their heads that there was nothing to talk or write about, and it came to pass that the profession of telephone

engineering was a joke. And there was truth in that, for under monopolistic control there was little advance; no ideas wanted from the rank and file; only a few were thinking, and they were overworked. Muzzled opportunities, destroyed incentive and lowered dignity did their work well, and a great harvest awaited the brain of the Independent worker. That he reaped well is no idle story.

Another instance of the absolute secrecy of monopolistic control was shown by a vote of the members and associates of the American Institute of Electrical Engineers in 1900, when they were asked to name twenty-five men who, in their estimation, were leading spirits in the development of the electrical science. The first three names were to be italicized as the leaders in contributions of vital nature. Assuming that telephone development was of importance, I placed the name of a man in third place whose contributions to the telephone science ranked as high as any other individual in street railway, lighting and power practice. But to my surprise, not another man chose to place this man's name, even among the twenty-five. No one among the representative electrical men knew this man, or appreciated his work.

But the scene has changed. Brave pioneers contested the false claims of the monopoly, and gave to the world the benefits of competition of ideas. Four magazines, devoted exclusively to telephone topics and interests, are periodically sending out the best of information, and are inviting the ideas of each and every worker in the field. Opportunities are everywhere, and incentive is at its best. You will see the professional cards of numerous telephone engineers, whose reputations are widespread, and whose abilities are unquestioned. And they are busily engaged. Problems are solved, and the public receives the benefit. Thousands of thinkers are at work on the problems of communication, and many years will not elapse when a person will not dare to prove that its development has lagged behind the other factors in the country's progress.

The National Independent Telephone Association has set a good example, and let us hope that all interests engaged in telephone engineering will realize the necessity of publicity, of setting forth their problems, to let the world have a chance to applaud the deeds of telephone engineers.

Telephony needs no other aid but publicity in arriving at its proper dignity. The conventions are doing their part, and let each man with a good thought speak it out.

The next speaker was James B. Hoge, the subject of his paper being "The Value of Organization," and the text of which is herewith given:

Organization is the watchword of the twentieth century. There never was a time in the world's history when the subject of organization received so much attention as at present. It is generally conceded that proper organization is a good thing, but that in some cases its privileges are abused. However, that does not condemn organizations any more than the fact that the daily violations of laws condemns the necessity of having national, state and municipal laws for the government of our people. The subject assigned me is the one commanding the best thought of Independent telephone people to-day. It is now about ten years since the first Independent telephone properties were put on an operating basis. Very few were put in successful operation until 1895; comparatively few until 1896 and 1897. The National Independent Telephone Association was organized in 1897, principally for the purpose of defending patent litigation that was then threatening the very foundation of the Independent movement. The way this association covered that field and protected the patents is now a matter of history and needs no explanation or defense. The Independent telephone movement has grown beyond all expectations. The Bell company had controlled the telephone situation more than seventeen years and had less than 300,000 telephones in operation. When the basic patents expired the American people only needed to be allowed the privilege of using the telephone and applying it to their business and social life in order to appreciate its full value.

During the past ten years the Independents have installed more than 2,500,000 telephones connected with their various systems throughout the United States. During the same time their competitors had many times doubled the number they had when the Independents were allowed to enter the field, so we find that the telephone growth to-day is greater than that of any of the other public serving corporations. The result has been that the Independent telephone companies have extended their systems from county seat to county seat and from center to center, until to-day they are touching elbows with each other on practically every boundary line. Until the past three years they had but very limited long distance service. To-day their long distance service in many cases is equal to their competitor, and promises in a very short time to be in every way equal, if not superior, to their service.

The Independent movement is made up largely of the most substantial and most active business interests in the country. The leaders of the movement have gone into the business from various other vocations, and the result has been that they have carried their former ideas as to bookkeeping, operating rules and regulations, from the banking, manufacturing, mercantile, transportation, gas and electric light business into the telephone business. It is important and necessary to standardize rules and regulations, forms of accounting, advertising methods, equipment and various other essentials, so that the single companies may be operated as a single property. It is no more necessary to consolidate these local exchange properties, in order to carry it out successfully, than it would be to consolidate all the steam railroads or electric railroads in the country, in order to operate them successfully on a uniform basis. Several years ago the steam railroads adopted the standard gauge of track, so that to-day every road in the United States has adopted the same. Locomotives and cars made in the various shops of this country are so thoroughly standardized that they can be operated successfully in trains with other cars and locomotives from one end of this country to the other. Brakes, couplings, etc., have been standardized so that there is no longer the necessity of telegraphing or writing to find out whether or not the equipment of this road or that road can be operated over the tracks of some other company. Rules and regulations governing the handling of passengers, baggage, etc., have all been standardized so that to-day through tickets are sold over the lines of the various companies, baggage and freight are billed through and rates are quoted from one distant point to another. Schedules have been arranged so that trains connect with each other at terminal or junction points. Time for operating trains has been standardized, thus simplifying the matter of traveling, making it more convenient to the public and less annoying to the operating companies.

The American Bankers' Association, which held its convention in New York city last week, has for the past fifteen years been working out a system for the banks of this country that has simplified the methods of handling their business, and at the same time they have thrown around themselves, by the enactment of proper laws and otherwise, a number of safeguards that enable them to deal more cautiously with the very life-blood of our commercial and social welfare. A number of those most actively identified with the Independent telephone movement have been active upon the committee of that association working out economies and throwing around the association the safeguards mentioned.

During the past five or six months I have been in correspondence with the various officers of a number of state associations and find that in nearly every case they agree that the time is ripe for better organization. What we need to-day is uniformity of organization. There is no other business parallel to that of the Independent telephone companies. In Ohio a decision has recently been handed down by the Supreme court of the state declaring that city councils have no right to regulate rates, which was of extreme importance to nearly all of the operating companies, as in many cases the early franchises provided for rates that were too low to carry on the extensive business that the companies are now doing. In practically every case the subscribers recognize that they are getting a more extended and better service than they expected at the time the franchise was granted and the early contracts entered into, and are therefore willing to sign new contracts at fair rates. However, the early franchises provided a means for the grandstand politician and municipal reformers to start litigation against the various companies. This decision has therefore been most valuable to most Independent telephone companies, and especially to those in Ohio. If this suit had been inaugurated against some weak company and had been allowed to go by default the results might have been most disastrous. With the proper kind of organization suits of this character would be fully protected. In the postoffice fight last winter, which was fought vigorously by the Independent companies, there was a great deal of duplication in the way of letter writing, personal interviews, etc., which, with the proper kind of organization, could have been taken care of successfully by having each state take care of its own senators and each district in the various states look after their own congressmen.

In addition to this the advantage of a strong organization would carry weight with the various legislative bodies, national and state, much greater than where taken up in a haphazard sort of way without proper organization. During the past eight months we have recognized our Ohio association by dividing the state into nine districts. The state association has a president and nine vice presidents, secretary, assistant secretary and treasurer and an executive committee of four members besides the president, he being an ex-officio member. There is one vice-president from each district and this vice-president is president of his district. Each district has an executive committee consisting of one representative from each county in the district. Hereafter our state association meeting will be a delegate body. Each district will elect one delegate to the state convention for each 1,000 telephones or fraction thereof they have represented by their district associations. A mile of long distance toll line is counted as one telephone. In this way district meetings will be held quarterly and semi-annually so as to bring people with common interests together frequently to discuss subjects of special importance to the district. In this way operating methods, rules and regulations, etc., can be standardized, and meetings can be held with the loss of but very little time and at a nominal expense.

The state association will take up subjects of special importance to the Independent telephone interests of the entire state. We believe this plan is feasible and practicable for all the states in the union to adopt. We believe it feasible and practicable to carry it a step further, making an organization of the various state organizations so that the various districts would elect one delegate annually to a gen-

eral convention, and the state associations at their annual meetings would elect a sufficient number at large so as to give the state one representative for each 10,000 telephones or 10,000 miles of toll line they have represented in their state associations. In that way the state delegations would be able to exchange ideas and to conduct their business on a uniform basis. Statistics can be accumulated and published that will be of special value to the Independent companies by working the entire plan out on a basis of this kind, and the securities of the various companies will be strengthened. The equipment of the companies will be improved upon from time to time. The disposition of two companies to parallel lines or to compete with each other in any way will be a minimum. The matter of adverse legislation, national or state, can be protected. This sort of an organization would be able to get the best results from their various business and political leaders.

This is not a new method of organization; it is applying a well established and well developed plan to our business. It is human nature to take pride in being part of a successful organization.

As a matter of practical illustration I wish to call attention to but two points which I believe will explain themselves: (1) The matter of toll station signs. Up to the present time almost every company has had its own ideas about the same, and the result is that any one of the operating managers here assembled would not know what to look for if he went into almost any city twenty-five to 500 miles away from home. That being the case, how do you expect the traveling public to keep track of the different companies and different forms of toll signs? In June of this year I spent nearly three weeks here on the fair grounds, and I must frankly admit that it was much easier for me to locate a Bell pay station than it was the pay stations of our friends, the Kinloch company, for the sole reason that I did not have to read the American Bell sign, but I did have to accustom myself to the Kinloch sign, which takes practice.

Operating rules and regulations must be standardized. Some time ago I undertook to carry on a long distance conversation over three different country lines, all of which had different operating rules about monitoring lines, and the result was that our conversation was killed by the kindness of the various monitors.

In conclusion I desire to urge the importance of proper organization. We must draw a line to perfect the Independent system, and then cut to that line; then the results will be most advantageous to all. First, it will improve and simplify the service which benefits the patrons. Second, it will reduce the operating and construction expenses to a minimum, give greater stability to the securities and be generally beneficial to all companies. There is room for two telephone systems, but not room for a third. With the proper organization on the part of the Independent companies, they will continue to be the stronger and will receive their full share of the business upon a fair and profitable basis.

An informal discussion followed, participated in by C. J. Simmons of the Atlanta Telegraph and Telephone Company of Atlanta, Georgia; Thomas W. Finucane of the Rochester Telephone Company, Rochester, New York; Col. H. C. Young, Columbia, Pennsylvania; Senator C. W. Kline, Consolidated Telephone Company, Hazelton, Pennsylvania; E. B. Fisher, Citizens' Telephone Company, Grand Rapids, Michigan.

J. B. Hoge then moved (seconded by T. B. Lee) that a committee of seven be appointed by the chair to bring a report on organization, benefits and ways and means. The motion was carried and the chair appointed the following as members:

J. B. Hoge, Cleveland, chairman; C. W. Kline, Hazelton, Pennsylvania; H. Linton Reber, St. Louis; J. B. Earle, Waco, Texas; E. B. Fisher, Grand Rapids, Michigan; Ed. L. Barber, Kansas City, Missouri; Cyrus Huling, Columbus, Ohio.

The convention received and accepted invitations to inspect the Kinloch Telephone Company's exchange, and to visit the Tyrolean Alps on the Pike as the guests of the Kinloch Company.

Adjourned to meet at 10 a. m. Thursday.

THURSDAY, SEPTEMBER 22.

At 10 a. m. the convention was again called to order by President Dougherty.

By special request of Frederick S. Dickson, president of the Federal Telephone Company of Cleveland, Ohio, his paper was advanced on the programme and was the first read at the day's session. "Independent Finances" was Mr. Dickson's theme. His paper was full of clever anecdotes and witticisms and made a distinct hit. It follows in full:

I am not a little surprised at finding myself on my feet before this distinguished body of telephone experts. In the past I have uniformly refused like invitations, saying that I was but a novice in the telephone business, trying hard to find out something about it, yet promising that if I ever did find out anything I would let my fellow-workers know it. A certain Michael Flynn was awakened in the darkness of the night by the hoarse whisper of his wife, "Michael, Michael, there's a burgular in the room," and Michael responded, "I have me oi on him and if he finds anything, I'll get up and take it away from him." This, in a measure, is my attitude. For two or three years past I have had my eye on the Independent telephone business, ready to take information, no matter who found it, and now, even though I have consented to impart my discoveries to this audience, I am still oppressed by grave doubts as to whether I have yet discovered anything worthy of being imparted to others.

Two telephones in a house or office are, I am aware, open to objection. An office boy lately went to his employer with the announcement, "A lady wants to talk to you on the telephone." Having two telephones, the man naturally inquired, "Which one?" and the boy responded, "I don't know, sir, but I think it's your wife." Now I am in a measure in accord with our natural enemy—the Bell—when they declare that the telephone is a natural monopoly and insist that there ought to be but one system in any community. I say *"ought."* The Bell company, being in possession, *ought* to have given good service at reasonable rates, thus rendering competition practically impossible. Unfortunately for the community, however, the Bell Telephone Company never *did* give proper service at proper rates until forced to attempt it by Independent competition. When it had the field to itself its service was uniformly bad; at least it never was as good as they could have made it. Moreover, it was not properly developed for the accommodation of the public. It was the policy of the Bell company to develop only in our larger cities and towns, and to develop there only in the thickly settled quarters, actually refusing to run their lines into the sparsely settled sections, desiring to do only the most profitable business in the thickly built up centers. In every case with which I am acquainted the Bell company waited until the Independent company began laying its conduits and stretching its cables before offering accommodation to the residence section of the city. Thus, in Cleveland, when the Cuyahoga Telephone Company began work, the Bell company had but 4,200 telephones installed, and its rates were $120 a year for a business telephone. This meant that every business man was paying the Bell company nearly three cents for each possible connection. Now, mark the significance of these figures. Remember, the value of a telephone depends solely upon the number of telephones with which it may be connected. The customer does not pay for his own telephone at all, but for the telephones he can call up, and his bill for this is cheap or dear as his connections are great or small. There can be nothing else in the proposition, excepting, of course, the quality of the service. The advent of competition changed conditions radically, and the Bell company, which before had but 4,200 telephones in Cleveland, rapidly increased to 16,000 and at the same time decreased its charges from $120 a year to $84, so that the Bell subscriber who before paid nearly three cents for each connection now pays only a little more than one-half cent per telephone. If a party takes both telephones he will pay at the highest business rates $156 a year and will have at his disposal not less than 28,000 telephones, thus paying less than six mills a year for each telephone to which he has access, as against nearly three cents per telephone in the days of monopoly. In other words, competition has reduced the cost to one-fifth of what it was and bettered the service.

However objectionable two telephones may be in house or office, in view of these results, two telephones seem to be a necessity at the present time, and I am inclined to believe that competition will continue to the benefit of the general public until one party or the other is exhausted. Which is to be the ultimate victor is a question which the future must determine. Local ownership will be a factor of prime importance, and the more numerous your local stockholders the greater will be your advantage. If you had two telephone companies in a city, one owned in Boston and the other in Cleveland, neither company would have an advantage over the other, but the Independent exchange in each city *should* be owned and controlled by its own people. Such ownership will insure better service and a local support with which the foreign owned corporations cannot long compete.

But, after all, local ownership, while an effective ally, will not in itself insure success. You have got to do something more. You've got to do better work. You've got to give better service than your rivals are giving; and here a very serious proposition confronts you. In an ordinary business a large percentage of the employes perform routine work and do not come into direct contact with your customers. You can pick your men and women who *do* come in contact with the public with some degree of care, but in the telephone business you have got a long row of operators who every moment are in contact with the public, and their promptness, their politeness and their general efficiency are what will make your service good or make it bad. You can watch them with monitors, though only to a limited extent, after all. You can discharge those who are inefficient, but, in most cases, only to take on those equally inefficient. What you want to do is to make those you have efficient if you can. Make them, if possible, take an interest in making your service good and your business profitable. I know of a young fellow who was

asked how he liked his job and he responded, "Oh, first rate; got an interest in the business." "You don't say so," his friend exclaimed. "How'd that happen?" "Well, the old man called me in and told me if I did not take more interest in the business I'd have to quit, so I took the interest." Now the possibility of losing one's occupation may induce an employe to do better work, but, after all, this motive only goes so far. It only induces a man or woman to do just enough to hold on to the job. But the employer wants more than that. He wants the best there is in his employe. He wants to retain the same people about him year after year, if possible, and he wants them to become each year more efficient than they have been in the past.

The wise man does not want about him a lot of drifting incapables, always changing their job and always trying to get the most possible wage for the least possible work. I, for one, am a firm believer in profit sharing with employes. Pay first of all a fair wage and then give a reasonable percentage of profits to the employes, instead of the periodical slight raise in wages with which we are all more or less familiar. If one wants more wages, let him work more, save more and earn more, and the profits earned will give him more. We have tried this plan with encouraging results for the past year in the Cuyahoga Telephone Company and we propose to continue it for another year in any event.

Now just a word on the question of service. Do what you will, telephone service can never be made perfect, because it must depend in a greater or less degree on the human element, and humanity never has been and never will be anything but imperfect. You know Jeremiah says, "The heart is deceitful above all things, and desperately wicked. Who can know it?" While the psalmist declares, "I will not know a wicked person," which indicates that David would not have been a success in the telephone business; at least, his acquaintanceship would have been very limited.

I was at Put-In-Bay one day last summer and going into a telephone booth, said, "I am F. S. Dickson, president of the United States Telephone Company, and I want my own home in Cleveland, 595 Euclid avenue." I got the Cleveland exchange all right and the young lady there informed me that I had no telephone. I was actually too paralyzed to contradict her, and never got that message through at all. I tried to investigate this matter, but without any result. It was simply that desperately wicked human element again. You may have the very best mechanism, but when you have two desperately wicked human beings at either end of the wire there is bound to be trouble of some kind.

People will trust to memory for numbers, and of course, fail lamentably, for the "memory of them is forgotten," as Ecclesiastics has it. One of the physicians of Cleveland was driven almost distracted because people would call him up at all hours of the night with the inquiry, "Is this the morgue?" Out of pure pity we changed his number to one that would not resemble anything so suggestive to a medical man. One charming lady in Cleveland called her physician's number by memory last winter and at once began her conversation, saying, "I want to go to a dinner to-night and want to know if I can wear a decollette gown," and the answer came, "Excuse me, madam, but we don't care what you wear. This is the Lake Shore freight yards."

I know our friends in Chicago claim that the use of the automatic system eliminates the human operator. Well, so far, so good, but I am looking for a system that substitutes also a mechanical subscriber for the flesh and blood one. I am looking for a machine which will speak plainly, say what it wants promptly, hang up the receiver when it is through and pay its bills with mathematical accuracy on the first day of the quarter. This automatic system puts in the hands of the ordinary man a delicate machine and expects him to operate it successfully, while the ordinary man has not enough mechanical genius to enable him to drive a nail without hitting his thumb. Then, too, there is some disadvantage in getting rid of the human element in an exchange. If things do not go right, who can the subscriber blame for it? Was any man ever thoroughly happy who did not have a woman to blame things upon? I know of an elderly couple who went on a visit to California, and while there they were treated to a genuine and very substantial earthquake. The old lady was telling her experiences to her niece afterwards, when the latter inquired, "Weren't you awfully scared, Aunt Charlotte?" "Why, no," she said, "not a bit; indeed, I rather enjoyed it, for do you know, it is the first thing that has happened in forty years which your Uncle John didn't blame me for." No, you will never have perfect service in any telephone exchange until you get a mechanical subscriber, but, nevertheless, it is your most imperative duty to see to it that you *do* have the very best service possible.

Now, there is another point. No business can be managed successfully without hard work—not hard work on the part of the lesser employe only, but hard work on the part of all. The manager must work harder than his clerks, and the president hardest of all. John Wanamaker of Philadelphia was once asked, in my presence, to tell the secret of his great business success, and he answered, "There *is* no secret. The simple, open fact is that I am always at it." And, after all, that is the secret of success in every walk of life. It is the strenuous man we want, for it is the strenuous man who gets there, whether it be at the head of a telephone company or at the head of the American union. Henry A. Everette of Cleveland has on his office wall the motto, "All things come to those who hustle while they wait." A friend of mine once advertised for an office boy, and, of course, got a host of answers, many with recommendations from Sunday School teachers, some with a favorable word from the Sunday School superintendent and one, at least, with the preacher's endorsement. One came, however, with no recommendation at all but its own intensity. The application read: "Dear Sir: I'd like the job, for I'm an orphan, and have to hustle; and it beats h—l how hard times is." And he got the job and held it down.

I am afraid some of our friends are under the impression that their chief duty in life is to fight the Bell. This is surely a mistake. An old Methodist clergyman was giving his friend his notion of the proper way to worship God. "Why," exclaimed his friend, "you Methodists don't worship God, you only fight the devil." I believe that our chief duty in life is to give our customers the best service possible, and at the least rates practicable. Let us first please our telephone users with efficient service and we can then also please our telephone investors with attractive dividends, and whether the Bell company is pleased or displeased thereat will not affect us in the least. Don't bother your heads about the Bell company until the Bell people get in your way, and then run over them. The wise Polonius said:

"Beware
Of entrance to a quarrel; but, being in,
Bear't that the opposed may beware of thee."

Translated into our modern American tongue, this means, "Don't hunt for trouble, but if the other fellow is hunting for trouble, see that he finds plenty of it."

I was at Yale University with E. J. Hall, now vice-president of the American Telephone and Telegraph Company, who was then and is yet one of my warmest friends, as he is also, I believe, one of the ablest telephone men in the country. I called at his office in New York shortly after attempting to enter the telephone business and Hall introduced me to Mr. Fish, the president of the corporation. Mr. Fish greeted me cordially and welcomed me into the telephone fold, only regretting, as he said, that I was on the wrong side of the fence. I smilingly replied that I was new in the field and was not quite assured as to which *was* the right side of the fence. Mr. Fish thereupon retorted that I could not possibly succeed in my efforts in Cleveland. "We have let you people alone so far out there," he continued, "but you can't expect us to ignore you much longer. When we are ready we will simply crush your enterprise." "Well, Mr. Fish," I answered, "your attitude reminds me of an old story of the stage coach days in Pennsylvania. They used to run a coach from Lewistown on the Pennsylvania railroad over to what they called the Bank, in Center county. One night a passenger in the coach seated by the driver proceeded to give a most uncomplimentary opinion of one Bill Thompson and added, 'The next time I see Bill Thompson, I am going to give him the worst licking he ever had in all his life. I'll lick him so he can't stand up.' At this the driver, a Pennsylvania Dutchman, said, 'Vell, now, dond't you do it.' 'Why not?' asked the angry passenger. 'Vell, I tell you,' said the driver, 'Bill Thompson is d—d industrious ven he's getting licked.'" Now, I don't know that I have annoyed the Bell company in the least during the past two years, but I *do* know I have been mighty industrious, and I am not licked yet. I *do* know that the Cuyahoga Telephone Company is giving better service than the Bell, and for less money. I know also that we have added over 3,000 telephones in Cleveland during the past five months and we are increasing right now at the rate of 700 a month. So we're not licked yet.

The Independent telephone industry has been subjected to much adverse criticism, owing to a most peculiar condition of affairs. In an ordinary town you might find a Bell exchange with, say, 250 telephones in service. An Independent company would be formed, $65,000 raised and invested in an exchange with a capacity of 750 telephones, three times the Bell plant, and rates established at $25 and $15 a year. Now this amount of capital will build and pay for a very good exchange, and economically managed at these rates it will earn a reasonable profit, but no sooner was the plant installed than customers rushed in with contracts, and in a short time these people found that they had 1,500 telephones in service instead of 750 and no money provided for extra equipment, made necessary by reason of a development that had not been anticipated and was not then dreamed of by the wildest imagination. The rates were far too low for this new service and the company should have increased rates at once to about $36 and $20, as they were giving their customers double the anticipated service, and six times the old Bell service; and they should also have increased their capital account by at least the cost of the new equipment. Unfortunately, they did neither of these things. They used all their income to pay for equipment and extended their paper, hoping something would happen to extricate them from their difficulties. They had no means to pay dividends, though they had earned them. They had no money to pay interest on their bonds, though they had earned their interest and more. Had they distributed their earnings, as they should have done in the form of dividends, they would have had no difficulty in selling their bonds and stocks at a fair price, and could thus have provided money for their extensions. They should have met this issue exactly as every manufacturer would have met a similar issue. If a manufacturer has in service twenty machines and his business increases so

he can sell fifty per cent more goods, he willingly invests additional capital in the purchase of ten extra machines, because he sees at once that the cost of these machines will be his only increase in investment. There is room on the floor, and the boilers are large enough to supply the extra power. He has no increase in his bills for light, heat, rent and superintendence, and the like, while he has a clear increase of fifty per cent in his annual output. He, therefore, makes his investment with a light heart and with full confidence in the future.

The conditions in the telephone industry were exactly similar if the people could only have been made to see it. The Bell company had been charging $36 and $20 rates for 250 telephone connections. If the new company had only attempted to give 500 telephones at $25 and $15 rates they would have made money, but they attempted the impossible when they essayed to give 1,500 connections for what would have been a reasonable charge for 750. This the people, both investors and users, could not be made to see, and the most of them don't see it yet. To all the telephone companies that have gone through this experience and are not yet out of the mire, I would say with what emphasis I am capable, stop at once this suicidal method of financing. Capitalize your extensions, capitalize every dollar honestly expended in your plant and save your earnings for interest and dividends. This is the course the Cuyahoga Telephone Company will pursue if I understand the temper of its directors and stockholders. We will increase our capital to take care of development and during the coming year every owner of its bonds will receive his interest promptly on the day it is due, as he has done in the past. Every holder of its preferred stock will receive his dividends, because the dividends will be earned and will be saved for those who are entitled to receive them, and certainly not later than a year hence we will be paying our common stockholders an honest dividend honestly earned.

I have attended more than one of these telephone conventions, and while I thought they were all productive of some good, yet it has always seemed to me that there was made manifest, after all, too much of the spirit of talk and too little of the spirit of work. It is well to remember the husband who snored, and whose patient wife wakening him gently suggested, "You wouldn't make so much noise if you kept your mouth shut," and he answered, "Neither would you." It is well sometimes for all of us to keep this fact in mind. None of us will make as much noise in the world, and we may do more work, if we keep our mouths shut. I am aware that in appearing before you I have laid myself open to the same criticism I have been making of others, yet for it I crave your pardon, upon the ground that it is my first offense. A youngster of my acquaintance the other day locked himself in the bath room, turned on the shower and both the spigots in the tub, tossed into the water all the towels, soap, sponges and other getable objects and enjoyed himself thoroughly until the water overflowed into the library below and his father's knock thundered on the door. As the door was opened the irate parent exclaimed, "Why, you infernal little scoundrel, what in ——" but his eloquence was checked by the youngster, who, with a wave of his hand said, "This is no time to talk, dad; get a mop!" This, then, is my message to you all. Stop talking! Get a mop! Don't abuse the Bell! Get a mop! Stop telling why you haven't been earning money in the past! Get a mop! Don't try to excuse bad service! Get a mop! Take my advice, every one of you! Go home and get a mop!

Following Mr. Dickson's paper, President Dougherty appointed E. B. Fisher of Grand Rapids, Michigan; Max Reber of St. Louis, and George W. Beers of Fort Wayne, Indiana, as a committee on nominations, to present names of officers for the following year.

The second paper of the day was by Edward E. Clement of Washington, D. C., "The Patent Situation" being his subject. It follows in full:

The subject of patents has probably been as generally and closely considered by telephone men in the United States as any subject, even engineering practice, bearing on their chosen work, and this for a very good reason. They have been forced to consider it or stay out of business. When the telephone was born, as usual there were several claimants for the honors of fraternity and when the Supreme court, by anything but a unanimous vote, confirmed the claim of Bell, it gave additional impetus to a fight that has raged ever since, and which bids fair to continue as long as men need to annihilate distance and use wires instead of legs. So when a man has come into the telephone business he has needed some money, more sense and a lot of nerve, together with a good knowledge of the patent situation or a competent advisor—and a man has had to be a fighter to succeed. The reason some of the early manufacturers got their start so well was that in 1894 and 1895 the people at large were like a lot of sheep waiting to see which way they scented the wolf, and watching the dogs that wanted to lead them, half in admiration and half in distrust. These men got a reputation as fighters, and I occasionally get letters yet from back country districts up northeast or out in the west recalling the fears and shakes of the old days, ten years ago. These very words "old days," when we consider the brevity of the real time that has elapsed, tells a story. A giant has grown from a puny infant in that brief period. All the thirty or more suits brought by the Bell company, and the thousands of patent claims outstanding, have proved only "packthreads on Gulliver," powerless to hold him down. And the full promise of the giant's youth is not yet realized

All civilization rests on two factors—transportation and communication. The time will come when the electric telephone and the electric railway will encompass and cover this broad land, if not the world, from ocean to ocean, and the telephone at least will cross the oceans. The present occasion furnishes a convenient opportunity to look backward as well as forward, to review past achievements and to forecast from these what the future may hold.

We are met here for one purpose, which all present, I believe, hope earnestly may be accomplished. I refer to the formation of a strong, representative and truly national association, which shall not only serve to unite and harmonize the operations of the various state organizations, but shall furnish an offensive and defensive alliance in the best and fullest sense. The necessity for such a body is strongly apparent, and its effect, not only in strengthening the market for telephone securities and insuring protection from patent persecution in the courts, but in adding to the facility and ease of transaction of business, cannot be overestimated. With regard to patents it is far too soon to consider the field as open. On the contrary, in this case, as in every other, eternal vigilance is the price of liberty. The old association has done excellent work in defending the suits brought under the Berliner and other patents, but its future work, if properly carried out, will be even more important. Day by day more patents are being issued, month by month the Bell interests and the Independents alike are acquiring new leases of monopoly on the application of principles, which in the near future will become essential to the operation of high grade systems. The patent office is issuing an average of over thirty patents a month, and whereas a few years ago two examiners could handle the class of telephony, it now takes four, with the assistance of a fifth, and they are overworked. Few people have any adequate conception of what the patent situation has meant in work and money expended. I will give you a few figures to illustrate:

There have been issued 4,298 telephone patents, of which 3,798 are in the class of telephone proper and 500 are scattered. I do not include in this number all the patents for electric lighting, power generation and distribution which have a bearing on telephone systems as installed, but I should say there are probably 500 more of these. The modern telephone plant is not essentially telephonic. It comprises really a power generating and distributing system, with auxiliary telegraph system, whereby the supply of power is controlled. The only things telephonic about it are the transmitters and receivers at subscribers' stations and the central office.

Of the 3,798 strictly telephonic patents—that is, those so exhibited and classified—3,798 are for receivers, 683 are for transmitters, of which 216 relate to the granular type, 469 relate to exchange systems and 715 to switchboards, of which 465 cover multiple boards exclusively, and the rest single or transfer boards. About 75 of the system patents also relate to multiple boards and nearly 300 cover circuits which are applicable thereto. Ninety-five are to exclusively transfer systems, so the preponderance of choice in favor of the multiple board is thoroughly apparent. Of inter-communicating or house systems there are 57 patented, and of party line systems 577. Of the latter, 200 employ step-by-step selective mechanism, and I believe there are two things every man who has an idle hour tries his hand at—they are car couplings and step-by-step telephone selectors—both classes absolutely overworked.

There are 160 patents for transmitter arms and receiver supports, and 211 switchhooks. Last, but by no means least in importance at the present time, there are 125 patents for automatic exchange systems and apparatus. The actual number of automatic patents is small, but I assure you they must be measured by weight to be appreciated. No living man knows all the details of all the apparatus in those 125 patents, and no man ever will, not even the inventors themselves. Some of the devices are fearfully and wonderfully made, and some are distinctly abortions.

In these patents I estimate there are altogether 48,038 claims, each of course standing as a distinct patent for what it covers.

The patents have cost—

Government fees	$150,430
Attorney's fees and expenses	200,000
Interferences	300,000
Total	$650,430

This is what the patents themselves cost. It does not touch the value of the inventions, nor the amount at which they may have been capitalized, which has of course run into many millions. Nor does it touch the cost of litigation, past and present. For all this the people at large have to pay sooner or later. The manufacturer or operator is only a middle man, who collects on the one hand and distributes on the other. Out of the total number given, about 1,800 or 2,000 are owned or controlled by the Western Electric Company and the American Telephone and Telegraph Company (Bell).

Assuming that 30 per cent of the patents in the class of telephony have expired, and that 20 per cent are invalid or worthless, there remain 24,000 in force, many of which probably need serious consideration. A respectable percentage of these 24,000 belong to Inde-

pendent companies or individuals, but I wish to point out that without more than a friendly understanding (which binds nobody) this is no guarantee that suits will not be brought on them. If the Independent companies, both operating and manufacturing, stand together, the Bell interests can never again do them serious damage by patent suits; and the growth of public sentiment in favor of Independent investments will be sure, though slow; but if any amount of litigation develops among the Independents themselves, it will be the very worst thing that could happen, and must have a very depressing effect. The weakness of a house divided against itself is proverbial, and so surely as the larger Independent companies are gathering the elements of monopoly into their hands, so surely will division come. I know that men do not spend money in development and patents out of charity, nor do I mean to depreciate the full protection of every man's property; but surely there must be some division line between those things that are essential and those that are not. There are many patents on transmitters—683 in all—and the transmitter is a common necessity. Of the 216 granular instruments patented, probably 100 belong to Independent owners, and more are coming as fast as patent attorneys can hatch up new excuses for them. There are 327 magneto receiver patents, of which probably 75 are modern and in Independent hands. Suits on such patents as these, where they cover only differences in details, should be discouraged. Of course no one can be absolutely deprived of his right to go into court, but a strong restraining hand would tend to avoid scandals. My suggestion upon this point would be that a national arbitration board be appointed, and that it be made absolutely obligatory upon all members of the association or its component state associations, as well as upon those non-members with whom they deal as purchasers, that they submit all disputes or questions of infringement to this board *before* going into court. They need not disclose their proofs necessarily—but if a charge of infringement be made, the board should have an opportunity of passing upon the prima facies, so that if upon the face of things the complainant had not a righteous cause he would go on with the official stigma attached to him, stamped DISAPPROVED. This board, of course, would have to be made up of disinterested men of sufficient standing and technical knowledge to give their decisions weight. I believe such an arrangement would tend to discourage litigations over trifles, and in my belief large causes of dispute are few and far between.

The manufacturers have shown a meritorious desire to avoid infringement of any patents, and some of them have spent large sums in securing competent advice to this end. This is money exceedingly well spent. Another method of achieving the same result would be to form a pool to hold all non-essential patents, with a scale of reciprocal royalties, so that anyone in the pool could be free of the patents held for a reasonable sum per annum, which would be divided among the members in proportion to the pro rata royalties paid on claims they put in. This, however, is for the manufacturers to settle, although the operators are the parties most interested.

With regard to important suits of the past, or likely to be brought, especially by the Bell, in the future, the broadest patents are all expired, and the most threatening ones are out of business, temporarily or permanently. The Firman multiple board patent, the Haskins and Wilson busy test patent, the Seeley answering jack patent and the Bell common battery patent are all gone forever, while Berliner is on the shelf along with the narrow subject matter to which he was restricted and which no one wants to use.

The Scribner patent 330061 (expired) was sustained against the switchboard, put in use at Mobile, Alabama, but resulted in no other damage to the interests of the Independent telephone business. The Carty patent for the arrangement of bridging bells in party lines work was sustained in the Millheim case, but was reversed in the Anthracite case and is now awaiting final decision by the Court of Appeals.

The suits brought by the Western Electric Company against the Citizens' Telephone Company of Grand Rapids, Michigan, on the Eldred patent 303714 (106 F. R. 215) and the Watson patent 266808 (89 F. R. 670) and against the Western Telephone Construction Company on patents 215833 to Rosevelt (79 F. R.) and 270522 to Watson (81 F. R. 572) and against the Williams-Abbott Electric Company on the Gray patent 309617 (108 F. R. 952), all resulted in defeat for the patents sued on and established the right of the public to use the various switching and switchboard devices alleged to have been covered by them.

More recently Judge Wing decided against the Western Electric Company on suits brought by it against one of the Independent manufacturing companies for the alleged infringement of four of its patents (357359, 477616, 488033 and 552729) involving the construction of spring jacks and annunciators, while suits on the five common battery patents to Bell 346708 (expired), Stone 507568, Scribner 559616, Kitsee 430960 and Hayes 474323, brought by the American Bell Telephone Company against certain Independent operating companies, and suits brought by the Western Electric Company on patents 575653, 488038, 431531 and 11929 (reissue) against other Independent telephone companies have been indefinitely suspended awaiting the decision of the United States court on the alleged illegal purchase of the Kellogg Switchboard and Supply Company by the Bell interests. Numerous other patent suits have been brought and subsequently abandoned by the Bell interests, while suits on a number of patents, including 427629, 669708 and 667463, in addition to those above mentioned which have been indefinitely suspended, have not as yet received action from the courts.

Another decision has been rendered in Rochester within the past few days on a Bell patent, which will be welcomed generally. I refer to the Scribner patent 559411 covering the control of supervisory lamp in the third conductor in the cord. The patent is declared invalid, I am informed, and this opens one more door, which is of some importance.

On the whole I can see no reason to fear successful attack along any important line from the Bell company. I do not mean by this that there will be no suits, but they will be brought for effect only and the effect can be discounted if not entirely destroyed by a united and harmonious stand. With the same amount of reasonable precaution and the same investigation that an investor in any other field would feel bound to make, every assurance can be given that success will continue to crown our banners in the future as it has in the past.

Independent telephone securities are absolutely safe, so far as patent suits now being prosecuted or to be brought in the future by the Bell people may go. All that is needed to create confidence is union. I trust, in closing, I may be permitted to express my earnest hope, as one who has been with this movement since its birth, that its end will be more glorious than its beginning, or in oriental phrase, "May the end of this house be PEACE."

Samuel G. McMeen, the well known consulting telephone engineer of Chicago, read an excellent paper on "Planning a Telephone System," which follows:

I suppose a good many of you are saying: "I hope it won't be a long story; I hope he has not put in a lot of figures." Well, it isn't; and I haven't.

If all the towns were about alike in the ways their people are distributed over the town's territory; if the prices of materials did not change; if no improvements were made in machinery and supplies; if there were reasonable expectation that styles and fashions in telephone things would be constant; if it were just as easy to dig holes and ditches in the ground in one town as in another; if the people in one town were just as wealthy as in any other, and if the long distance line system were now complete enough to cover the continent: Then, planning a telephone system would be easy. In such ideal conditions a person with the telephone fever might place an order with the manufacturers for "one standard equipment of so many stations", and with the contractors for "one standard system of so many lines." And there would be a great final gratification in the fact that the real investment would be found very much like the original estimate; a condition which happens so seldom as to be quite striking when its does occur.

A certain gentleman who wanted to overhaul the plumbing in his house declined to give money to charity when requested. His reason was that he was about to spend several thousand dollars on his house, as the estimate alone was $350. Some of the people who have been attracted to the telephone business because it seemed to be cheap and easy, may drop a tear of sympathy.

It is no news to say that a plan for a telephone system, whether it includes merely an exchange for a town, or a toll line system as well, must plan to build the system at the lowest possible cost in investment, and the lowest possible costs of operating the thing when done, keeping it in operating condition, replacing parts of it when they are worn out, and replacing other parts at just the time it is wisest to do so to get the advantages of newer and better ways. There is a real difference between the annual cost of keeping the thing in operating condition, ordinarily called "maintenance", and the annual cost of replacing parts which are no longer serviceable, due to their having worn out or become superseded by something better. It has been supposed that the cost of operation depends mostly on good management, and this is probably true; but the more recent development of automatic apparatus is causing some of the old timers in the business to sit up and take notice. I do not mean to say that it is always cheaper to make the connections by machinery than by hand, but that there is much more reason now to believe that such a result may be reached than there was five years ago.

To accomplish the lowest cost in investment does not always mean lower annual costs in maintenance, depreciation and operation. You have seen systems which impressed you as having come into being largely by accident; in some of these a little inspection of the accounts will show such annual sums of unnecessary outlay as are really adding substantially to the effective investment. As a fundamental principal, it is supposed to be best to run your business on your own capital; but there are many telephone exchanges in which borrowed money applied in betterments would pay interest on itself, and a substantial profit besides. This because of the greater saving, even though the borrowed investment did not increase the gross revenue at all.

Differences of opinion among telephone men as to the right number of offices to establish in a fairly large city have been supposed to be due to the natural tendency of men not to agree with

each other. In large cities in Europe there exists a liking for one central office, with a large number of lines. In the larger cities in the United States, it is quite usual to prefer a number of offices. The explanation is very simple. As telephone systems are now built, a very large part of the annual cost of merely owning the system a year at a time, is in the wire plant; and this in a large city of only reasonable density of population, varies strikingly with different arrangements of the lines in offices; when they are centered in one office it is quite the rule that the average length of line is greater than when part of the lines center in one office and other parts in others. It is true that where there are several offices in a city, these must be joined to each other by trunk lines; but as trunk lines are so heavily used, it is never true that the total amount of wire in subscribers' lines and trunks is as great with several offices as it is with one.

In the cities of Europe a great many more people live in a given space than here. The lines are therefore shorter. Labor is cheaper. And in some cases, a one office arrangement was chosen because the engineers made a bad guess.

If there were no other reasons to be considered, more than one office in a town would generally be cheapest; but, fortunately or unfortunately, the cost for operators is always greater in the several-office arrangement than in that of one office. But in any town whatever, an arrangement can be found in which the total cost of owning and operating and keeping up the lines and offices, when taken as a whole, will be the least. In laying out a system of reasonable size, finding the number of offices and where they ought to be is one of the important considerations; and it is a condition which, if poorly established, can absorb a surprisingly large amount of money each year.

In a small city, one office is nearly always the best arrangement, and in the past it has been customary to assume that this would be so, and to plan accordingly, leaving the consideration as to what future arrangement might be best, to be taken care of by the future. It has resulted—and will result again—that it is found that the one office originally established, is in a surprisingly bad place when the day does come that others must be opened. By being in a bad place I mean simply that when additional offices are established, this first one may be found by its location to be adding to the annual cost of owning, operating and keeping up the system.

In establishing any office, even if the exchange be small, wisdom of choice is required with reference to the location of the building, its size and its character. I have pointed out that the location of the building has an effect on the length of lines. It also has an effect on the fire risk, and sometimes there is also a risk from high waters. Service has been interfered with by fire in an adjoining building, even though there was no immediate danger to the central office itself. Whether the building be owned or rented, the arrangement of the apparatus in it is best when not only the exact location of future additions is taken into account, but when a growth of unexpected amount is provided for. Instances have occurred where a plant otherwise good has been found to be very bad because the growth was great enough to carry the switchboards against a wall which could not be removed and in which direction the building could not be extended.

The best central office arrangement, other things being equal, is that which carries the entering cables, and those which are joined to them, through their runs with the greatest directness, and therefore at the smallest cost. In the larger offices a saving of a foot length in a cable run is a very considerable advantage.

As to choice among the many types of equipment now available, one may gain a great deal of information from the manufacturers, as they will tell you all about the good points of their own manufacture, and sometimes about the bad points of that of others. A great deal of light is thrown upon the situation, and the embarrassment of choosing is much relieved, by the application of a few simple but exacting tests to samples submitted by the manufacturers. In every case the prospective purchaser has a great advantage if he purchases in accordance with definite specifications covering his exact needs, because these things not only assist the manufacturer in knowing exactly what is called for, but assist the purchaser in protecting himself in case the things delivered are not satisfactory.

In all except the very smallest offices, careful planning of the equipment will usually make a saving in the expense of operators. Where local and toll duties devolve on the same operator during quiet hours, economy and convenience may both be accomplished by an intelligent arrangement of the switchboard locations.

Since the first introduction of lead covered cables, there has been a decrease in the use of bare open wire. Except as to the cost of the system, there is no reason why all wires should not be in cables. Where the development is very dense, it is really cheapest to carry cables directly into the buildings, but in residence districts it is best to strike a happy medium between all cables and all open wire. Because a subscriber should be connected as soon as his contract is secured, because to do so means a line must be ready for him in advance; because the future development of the residence districts can be guessed with less exactness than the denser districts, it is necessary that the multiple tap method of distributing cable conductors be used at least in some degree. If intelligently applied, the multiple tap method also reduces the wire plant cost below that of the more cumbersome open wire treatment of line ends, with its attendant maintenance expense, and annoyance of service interruption.

Like many other good things, however, the multiple tap system may be practiced to excess. There is no involved mathematical formula which will answer the multiple tap question for a given town, but it is possible and necessary as well, to make comparisons between the costs of several arrangements for a given territory. And these comparisons should be made with care enough, and patience enough, to make certain that the best way has been chosen when a conclusion really is reached.

In recent times quite substantial changes have taken place in the costs of things which go to make up the wire plant. It is gratifying that this is so, because this part of the system has always been predominant in using up investment. No matter how cheap, however, the materials for line construction may become, the proportion of labor cost to the total cost of the constructed thing will remain large. As a comparison, it may be interesting to know that the equipment for central offices and subscribers may be installed for from 5 per cent to 10 per cent of its cost, while very many of the elements of line construction cost as much for labor as for material. A thing which the constructor, therefore, must plan toward, is the elimination of labor wherever possible. There are two good results of such watchfulness; one is the natural keeping down of the total cost, and the other a higher final depreciated value. For if it costs a dollar to put a dollar's worth of copper in place, 50 per cent is more than you can ever get out of it by selling it as junk. This is one of the reasons why placing cables underground has had such an effect on annual telephone costs. Two cables just alike, one on poles and one in ducts, may reasonably be expected to have an annual depreciation cost of several to one in favor of the underground cable; and this without taking into account the superior lasting qualities of the structure which cares for the latter.

Without citing further examples, I think I may generalize by saying that it is necessary to apply these and other simple rules to the planning of a telephone system for a town, and to lay out the course of action which when methodically pursued will bring the original estimate and the actual cost reasonably close together, not only as to the first investment, but to the annual charges when in service.

Not the least important thing in preparing to make such a plan is to get on the ground, and become saturated with the local facts. It is gratifying to find by experience that an outsider may get such a knowledge of a town by tramping over it, by consulting public records, and by diligent inquiry from those who know, as to enable him to complete field notes almost as accurate as to the things he needs to know as those taken by the civil engineer in laying out a railroad. By this I do not mean merely finding out what is under the pavement, and where there are alleys and where none, because these are simple matters. The important thing is to get so many facts about the town as to enable correct guesses to be made as to where the future growth of the town will occur, about how fast it will go on, and in what direction it will push; what kind of houses will be built in this quarter, and what kind in that; the probable change in the business area, and its present tendency of expansion; is the street railway system going to develop this residence area more than that, or will a new district spring up next year? One of the greatest helps toward reasonably correct conclusions in this plodding sort of investigation is to cut it up into such small pieces that the great quantity of estimates will prevent a serious error being introduced by a few bad ones. In five hundred guesses the influence of one wrong one is not only relatively small, but each guess is easier to make with truth.

In all of these cases, the elements of estimate are made with a view to determining not so much what the town is to-day, but what it will be at the end of a selected period. It is not difficult to build a system for the present, for a town of known conditions. It is more difficult, and more important as well, to make the plan complete for the town which is to be, because it is that town which the system must serve. The only difference between the best method of planning to-day and those which have been used heretofore, is that the later method uses more care in details, and realizes more fully the kinds of mistakes which are likely to be made. Perhaps it reflects little credit on the engineers, but it is distinctly to the advantage of their employers that they have made almost all the blunders that are possible to be made; and it goes without saying, of course, that a man of reasonable common sense will not make the same mistake twice. If it were only long-lived enough, this tendency might result in quite a perfect telephone condition being reached.

One of our prominent western civil engineers, while visiting his uncle in New England, attempted to answer persistent questioning as to what he did for a living, by explaining the scope of his profession, how he and his brethren "harnessed the forces of nature to the benefit of man", and how through their activity, intelligence and experience, man would ultimately reach his deserved proud position in command of the universe. The blushing modesty which inspired these restricted statements, suffered a rude shock upon the query of his relative: "Ain't this engineering after all a

sort of fancy business?" It is somewhat with the view of letting you into our confidence that I have made the foregoing admissions. for engineering telephone properties after all is really a simple, common-sense matter, the more successful as it involves the more patience and sound judgment.

So far as I have described the manner of such planning, it has been in the way of accomplishing minimum costs. It goes without saying that the minimum cost plan must involve due consideration of the quality of service to be given. A plan which will not make good service, falls short of its mission, quite as would a manufacturing property which would not turn out good product This brings me to the very important and widely neglected feature of planning all parts of a telephone system, whether in a town or between towns, so that it may ultimately form a part of a successful continental telephone system. I do not mean by this merely that a consolidation of telephone interests may take place. What I do mean is that any plan falls short of its mission which does not involve making all elements as nearly as may be such as will be serviceable and useful when the continent is covered with a complete network of long distance lines, connecting exchange with exchange. You may answer with the day of such a system is so far away that it is foolish to waste money on it now. My answer is that the day in question is not so far away as many are thinking, and that it does not always mean an excess expenditure to take this into account. Further, in any telephone system which is wisely planned, there are elements which ought to last so long as to be overtaken by the time of which I speak. It is no fancy dream to expect such a condition. We will agree on this if we will stop to think of what has been accomplished by the Independent interests already. I am advised that there is under consideration the construction of a considerable length of long distance circuit of heavier copper than has ever been erected for any purpose of communication, and this by an Independent company. I can call to mind exchanges lying in the region of these excellent projected circuits from the stations of which I should be surprised to receive good speech even over lines of such cost and quality.

Dwight Sapp of Ohio and Senator Flynn of Pennsylvania were called on and gave their views on the subject of "Organization."

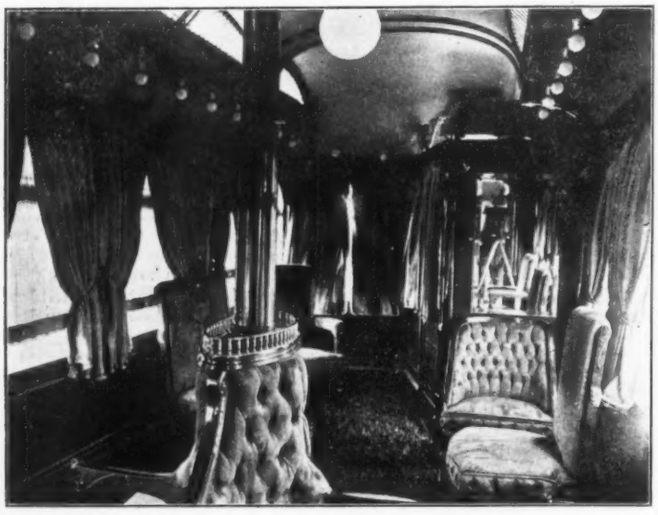
It was moved by E. B. Fisher and seconded by H. D. Critchfield that the old advisory board of the association be appointed a committee to draft resolutions for greeting and good wishes, to Judge James M. Thomas, ex-president of the association, and to express the regret of the convention at his absence from the meeting. Tributes to Judge Thomas were given in short addresses by Mr. Fisher, Mr. Critchfield, Mr. Sapp and Mr. Dougherty. The convention, by a unanimous rising vote, extended its good wishes to Judge Thomas, and showed its appreciation of his work.

On motion the name of the association was changed to the National Independent Telephone Association.

The committee on resolutions was ordered to prepare a plan of reorganization and to submit a new or amended constitution at Friday's session.

The convention then adjourned to 10 a. m. Friday.

The Controller Company of America, previous to adjournment, extended an invitation to the members of the association, through Harold D. Stroud, engineer of the company, to make a trolley tour of the city of St. Louis in the private car "Mabel" owned by E. G. Lewis, secretary of the Controller company, which was unanimously accepted. The trip included stops at the Kinloch telephone exchanges and other points of interest, not the least of which was the Mercantile Club, where an elaborate luncheon was served the visiting delegates. This was one of the most delightful features of the convention and was heartily appreciated by all who participated in it.



INTERIOR OF PARLOR, PRIVATE CAR "MABEL."

FRIDAY, SEPTEMBER 23.

Owing to the enforced absence of President Dougherty on the third and last day of the convention, Cyrus Huling took the chair and officiated as presiding officer. Frank L. Beam of Columbus was appointed secretary *pro tem.*

The committee on constitution presented the following constitution which was taken up section by section, and, after some discussion, was adopted:

ARTICLE I.

The name of this association shall be the National Independent Telephone Association of America.

ARTICLE II.

The aim and purpose of this association is to cement together in a firmer union, all Independent telephone interests in the United States, for the purpose of promoting uniformity of operation, maintenance and construction; to protect and defend the members of this association by moral effort, co-operation and such other means as may be available; and any and all other purposes that are to the best interests of the members of the association.

ARTICLE III.

OFFICERS OF THE ASSOCIATION.

The officers of this association shall consist of not less than fifteen trustees, one of whom shall be elected from each state having members or associations affiliated with this body, and as many more as may be necessary to give each state affiliated with this body, one representative; a president, first and second vice-presidents, a secretary and a treasurer (which latter two offices may be filled by one and the same person).

The president shall be a member and ex-officio chairman of the trustees.

ARTICLE IV.

COMMITTEES.

The president shall within fifteen days after the annual meeting appoint an executive committee of eight members, who with himself shall constitute a committee of nine, to be known as the executive committee of the association. The appointments made shall be approved by the two vice-presidents, treasurer and secretary, or a majority thereof, and in case any appointment shall not be so approved, the president shall appoint someone else agreeable to them to fill the place. The president shall also fill all vacancies in said committee within thirty days after they occur, subject to the approval of a majority of the foregoing officers.

ARTICLE V.

ELECTION OF OFFICERS.

The officers herein provided for other than the executive committee, shall be elected by ballot, upon the adoption of this constitution and thereafter by ballot at the annual meeting each year, and shall serve until their successors are elected and qualified.

ARTICLE VI.

LITIGATION, LEGISLATION AND OTHER COMMITTEES.

There shall be appointed within thirty days after the annual meeting, by the president, a committee composed of five members, which shall be known as the committee on litigation and legislation, which shall have charge of all legislation affecting the interests of the association, and inquire into all litigation that might affect the interests of the association or its members. The chairman shall appoint such other committees as the association may from time to time direct; said committees to be approved by a majority of the other officers as heretofore provided.

ARTICLE VII.

ANNUAL AND SPECIAL MEETINGS.

The annual meeting each year shall fix the time and place of the annual meeting for the following year, and special meetings may be held at such other times and places as the executive committee may from time to time direct. The call for any such special meetings shall set forth the subject or subjects to be considered at such special meetings, and no business affecting the general interests of the association shall be disposed of, except as specified in the call.

ARTICLE VIII

MEMBERSHIP.

Any state, district or local organization representing a major-

ity in interest in such district of Independent telephone exchanges. or telephone toll lines in the United States with not less than 500 units (each unit to consist of either one operating telephone or one mile of long distance toll line), and having subscribed to this constitution, shall be eligible to membership in this association upon an affirmative two-thirds vote of the members present at any regular or called meeting of the association; provided, however, that application may be made in the interim between meetings to the executive committee, who may pass upon such applications; and further provided, that the units represented by any such organization shall not be represented by any other organization in which they may have membership; and provided further, that after the state organization is completed in any state (or territory), representing a majority of the Independent telephones or toll lines in such state (or territory), district or local organizations in such states shall not be eligible for separate membership in this association, except upon the recommendation of the state organization, or when, after direct application to this association, that the reason for such direct application is valid and reasonable, whereupon they may be admitted by a two-thirds affirmative vote of the association and in no other way. Membership in this association, however, shall be contingent upon the payment of assessments levied as provided for in the following paragraph.

ARTICLE IX.

ANNUAL DUES.

The annual dues shall be levied from time to time by the executive committee, through the treasurer, who shall send out the call thirty days before the same is payable, which shall not exceed one cent per telephone or mile of toll line circuit per year.

ARTICLE X.

REPRESENTATIVES.

The several state, district or local organizations—members of this association—shall be represented at the annual or special meetings of this association by delegates chosen or appointed by such state, district or local organizations, in such manner as may be prescribed by the constitution and by-laws of such organizations, but the number of delegates so chosen shall not exceed one for each 10,000 units or majority fraction thereof, as prescribed in Article VIII. hereof. This member shall be entitled to one vote for every 10,000 units or majority fraction thereof. Local organizations having less than 10,000 units shall have such fractional vote as they represent.

ARTICLE XI.

QUORUM.

A majority of all the delegates present at the annual meetings of the association, or special meetings thereof, duly called, shall constitute a quorum for the transaction of business.

ARTICLE XII.

DUTIES OF PRESIDENT.

The president shall preside at all the meetings of the association, board of trustees and executive committee, and shall approve and countersign all orders drawn on the treasurer thereof, and shall be the general executive officer of the association for the purpose of carrying on the business of the association; and perform such other duties as may be prescribed by this constitution or the association.

ARTICLE XIII.

DUTIES OF VICE-PRESIDENTS.

The duties of the vice-presidents shall be to act in their order in the absence of the president, and perform such duties as would devolve upon the president, if personally present. They shall act upon appointments made by the president, as heretofore provided, and perform any other duties prescribed by the constitution of this association.

ARTICLE XIV.

DUTIES OF THE SECRETARY.

The duties of the secretary shall be to keep the records of this association and notify all members of any general or special meetings of the same to be held; draw all orders upon the treasurer, after approval by the president and auditing committee, and perform such other duties as the executive committee may require.

ARTICLE XV.

DUTIES OF THE TREASURER.

The duties of the treasurer shall be to collect all moneys from the members of the association, and to safely keep and pay out the same upon the order of the president, duly approved by the auditing committee. He shall also be custodian of any contracts or other papers, except the records of the proceedings of the association. He shall give bond of some approved surety company for such an amount as may be required by the executive committee; said bond to be approved by the executive committee and paid for by the association.

ARTICLE XVI.

DUTIES OF THE TRUSTEES.

The trustees may be called together at any time by the executive committee upon ten days' notice; this notice shall specify the object and necessity for calling the meeting. A majority shall constitute a quorum for the transaction of business. It shall be their duty to meet at the place of holding the annual convention, the day preceding the first session of the convention, at 10 o'clock a. m. At that time they shall appoint a committee of three to audit the books and vouchers of the association and report their findings to the convention. They shall hear reports of the officers and executive committee, and recommend a policy to be pursued by the association at their convention.

ARTICLE XVII.

DUTIES OF THE EXECUTIVE COMMITTEE.

The duties of the executive committee shall be to co-operate with the officers in promoting the interests of the association; they shall have the right to create the office of assistant to the secretary or treasurer, and employ one or more persons to fill these offices, who shall give their entire time to the interests of the association. They shall appoint an auditing committee of three, whose duty it shall be to audit all bills of the association before payment is made. They shall fix salaries of all officers and employes; said salaries to cover actual time spent in the interests of the association. They shall be allowed actual traveling expenses, when on the exclusive business of the association; they shall assist the officers in doing all things necessary to make the organization a success.

ARTICLE XVIII.

MEMBERS OR OFFICERS CEASING TO BE INDEPENDENT.

Any member or officer becoming in any way connected with other telephone interests than those identified with the Independent companies, shall be regarded by the executive committee as having tendered their resignation to said association. Anyone becoming a member of or accepting an office in this association, does so with the above understanding; and the executive committee shall, in case of resignation of officers, appoint their successors until the next regular or special meeting of the association, when the vacancies shall be filled.

ARTICLE XIX.

COMMITTEES AT ANNUAL MEETING.

The president shall appoint at the first session of the annual meeting, the following committees:

Committee on Credentials.
Committee on Nominations.
Committee on Next Convention.
Committee on Amendments to Constitution.

ARTICLE XX.

ORDER OF BUSINESS.

1. Meeting to be called to order by the President.
2. Election of Chairman.
3. Reading of the Minutes of the Last Meeting by the Secretary.
4. Report of Officers and Committees.
5. Appointment of Committees, Regular and Special.
6. Programme.
7. Hearing Reports of Committees.
8. Election of Officers.
9. Transaction of Miscellaneous Business.
10. Presentation of New Business.
11. Adjournment.

ARTICLE XXI.

BY-LAWS.

The executive committee may in its discretion adopt such by-laws as it may deem expedient, not inconsistent with this constitution.

ARTICLE XXII.

AMENDMENTS TO CONSTITUTION.

This constitution may be amended at any annual meeting of the association, by an affirmative vote of a majority of the members present; or at any special meeting, of which due notice shall have been given at least thirty days previously, to every member of the association, when such notice shall specify among other things, the sections of the constitution proposed to be amended, and the amendments offered thereto.

The secretary-treasurer's report was read and accepted.

Chairman Huling appointed J. B. Hoge, H. D. Critchfield and Edward E. Clement as a committee to select a meeting place for the association in 1905.

Chairman Fisher of the committee on nominations reported the selection of the following officers of the association:

President—J. B. Hoge, Ohio.

First Vice-President—Breckenbridge Jones, Missouri.
Second Vice-President—William Flynn, Pennsylvania.
Treasurer—Hugh Dougherty, Indiana.
Secretary—A. L. Tetu, Kentucky.

The report was unanimously adopted by the association.

The newly elected president, J. B. Hoge, made a fitting speech of acceptance, after which the convention adjourned.

Among those in attendance at the convention who registered were:

J. H. Bell, Hoosier Telephone Company, Salem, Ind.; J. C. Kelsey, Professor of Telephony, Purdue University, Lafayette, Ind.; A. A. Whitney, Morrow County Telephone Company, Mt. Gilead, Ohio; N. C. Watts, Staunton, Va.; Albert Schuler, Streator, Ill.; John T. Baldwin, Jr., Ironton Independent Telephone Company, Ironton, Mo.; C. A. Schock, Grayson County Telephone Company, Sherman, Texas; G. T. McQuiller, Lexington, Miss.; T. B. Lee, Pittsburg and Allegheny Telephone Company, Pittsburg, Pa.; J. B. Earle, Edward Rotan, Texas Telephone Company, Waco, Texas; O. F. French, Cuyahoga Telephone Company, Cleveland, Ohio; H. T. Dalrymple, Morrow Telephone Company, Mt. Gilead, Ohio; James B. Hoge, U. S. Telephone Company, Cleveland, Ohio; Frank L. Beam, Columbus Citizens' Telephone Company, Columbus, Ohio; E. Land, Grand Rapids, Mich.; Cyrus Huling, Columbus, Ohio; E. B. Fisher, Grand Rapids, Mich.; E. L. Barbour, Wauseon, Ohio; S. J. Bear, Topeka, Kan.; C. H. Judson, Council Bluffs, Iowa; C. W. Kline, Interstate Telephone Company, N. J.; Consolidated Telephone Companies, Hazelton, Pa.; H. C. Young, Columbia, Pa.; Hugh Dougherty, United Telephone Company, Bluffton, Ind.; P. J. Weirick, United Telephone Company, Monroe, Wis.; C. V. Nicholas, Columbus, Ohio; Dwight E. Sapp, Mt. Vernon, Ohio; C. Y. McVey, Federal Telephone Company, Cleveland, Ohio; L. F. Blasingame, Hawkinsville, Ga.; O. C. Snider, Home Telephone Company, Kansas City, Mo.; Virgil Biernton, Lebanon, Ind.; J. W. Sidener, John Walker, Ira J. Baker, Lebanon Telephone Company, Lebanon, Ind.; Lee Denny, Henry County Telephone Company, New London, Iowa; C. E. Stinson, Toledo, Ohio; Guy Watkins, Newark Telephone Company, Newark, Ohio; James McClamroch, Central Energy Telephone Association, Frankfort, Ind.; Delaware & Madison Counties Telephone Company, Muncie, Ind.; H. W. Karrenbrock, J. B. Greensfelder, Suburban Telephone Company, Clayton, Mo.; N. E. Liggett, Marysville Telephone Company, Marysville, Ohio; Lee Benoise, St. Louis; W. Roy McCanne, St. Louis; C. L. Brown, Abilene, Kan.; Edwin Fleddyobaun, Logan, Ohio; J. C. Myers, De Graff, Ohio; D. O. Yoder, Toledo, Ohio; George H. Metheany, Lima, Ohio; Will Van Middlesworth, Racine, Wis.; F. M. Flert, Home Telephone Company, Piqua, Ohio; James S. Brailey, Jr., Toledo, Ohio; Oscar Wentworth Rogers, West Union, Iowa.

The manufacturing and supply houses were represented as follows:

J. A. Russell, Swedish-American Telephone Company, Chicago.
R. Schweitzer, Crawfordsville Wire and Nail Company, Crawfordsville, Indiana.
Frank L. Perry, *Western Electrician*, Chicago.
M. R. Nyman, *American Telephone Journal Company*, Chicago.
W. H. Crumb, W. H. Crumb & Company, Chicago.
A. V. Overshiner, Swedish-American Telephone Company, Chicago.
J. R. Wiley, Standard Underground Cable Company, Chicago.
L. W. Marshall, *Electrical Review*, New York.
C. H. North, North Electric Company, Cleveland.
E. R. Warte, *Finance*, Cleveland.
H. D. Stroud, Controller Company of America, Chicago.
T. Lidberg, Swedish-American Telephone Company, Chicago.
Edward P. Baird, Baird Manufacturing Company, Chicago.
Arthur Kneisel, Telephone Hygienic Company, St. Louis.
Frederick Greer, Harvard Electric Company, Chicago.
L. W. Stanton, Cleveland.
C. W. Stiger, Stromberg-Carlson Telephone Manufacturing Company, Chicago.
J. F. Crook, Automatic Electric Company, Chicago.
C. L. Fisher, Automatic Electric Company, Chicago.
J. G. Ihmsen, American Electric Telephone Company, Chicago.
Ed J. Mock, TELEPHONY Publishing Company, Chicago.
A. J. Rousseau, Automatic Electric Company, Chicago.
Maxine Reber, St. Louis.
Carl Seyler, Hubbard & Company, Pittsburg.
A. B. Conover, Roebling & Sons Company, Chicago.
A. E. Barker, Dean Electric Company, Elyria, Ohio.
F. W. McMeal, American Electric Fuse Company, Adrian, Michigan.
Edward E. Clement, Washington, D. C.
F. E. Donohoe, American Electrical Works, Chicago.
H. B. McMeal, TELEPHONY, Chicago,
A. B. Kratz, North Electric Company, Cleveland.
Wm. A. Hopkins, Jr., Columbus, Ohio.
J. P. Cracraft, Stromberg-Carlson Telephone Manufacturing Company, Chicago.
A. L. Waterbury, American Conduit Company, Chicago.
W. A. Caldwell, Standard Underground Cable Company, St. Louis.
William Montrose, Commercial Electric Supply Company, St. Louis.
John E. Ecoff, Wesco Supply Company, St. Louis.
William E. Metzel, Measured Service Company, Chicago.
W. P. Bowman, J. A. Rowling's Sons, Cleveland.
F. F. Sapp, North Electric Company, Cleveland.
G. Hallett Johnson, Western Telephone Manufacturing Company, Chicago.
E. M. Deems, Gordon Battery Company, Chicago.
Frank B. Cook, Chicago.
F. W. Pardee, F. B. Cook, Chicago.
F. R. Parker, F. B. Cook, Chicago.
P. E. Allison, Atlanta, Georgia.
S. G. McMeen, Chicago.
Kempster B. Miller, Chicago.
George C. Bailey, J. A. Roebling's Sons, Chicago.
George W. Conover, Chicago.
J. A. Kenny, American Electric Fuse Company, Chicago.
Frank G. Jones, American Electric Fuse Company, Chicago.
J. J. Nate, Stromberg-Carlson Telephone Manufacturing Company, Minneapolis.
E. L. Clark, Valentine-Clark Company, Chicago.
P. C. Burns, American Electric Telephone Company, Chicago.
H. D. Critchfield, Automatic Electric Company, Chicago.
Harry Durant, Automatic Electric Company, Chicago.
J. S. Cuming, Central Telephone & Electric Company, St. Louis.
W. N. Matthews, W. N. Matthews & Brother, St. Louis.
G. H. Miller, Miller Anchor Company, Norwalk, Ohio.
W. E. Doolittle, Sterling Electric Company, Lafayette, Ohio.
A. E. Klunder, Holtzer-Cabot Electric Company, Chicago.
E. F. Kirkpatrick, McRoy Clay Works, Chicago.
W. H. Tripufin, Monarch Telephone Manufacturing Company, Chicago.
J. C. Hubacher, Monarch Telephone Manufacturing Company, Chicago.
L. Sands, Williams-Abbott Electric Company, Cleveland, Ohio.
L. G. Le Bourveau, Ewing-Merkle Electric Company, St. Louis.
W. W. Dean, Dean Electric Company, Elyria, Ohio.
J. C. Belden, Belden Manufacturing Company, Chicago.
Milo G. Kellogg, Chicago.
F. J. Dommerque, New York.
G. A. Roth, Roth Brothers' Company, Chicago.

INADEQUATE TELEPHONE SERVICE.

In New York City there is one telephone subscriber to every 500 of population. There is but one telephone company serving this city. In some western towns the ratio often raises to one in twelve, and these towns, many of them quite small, often support two (or competitive) telephone companies. Again, New York City, ten times the size of San Francisco, has only four times as many telephones, when its varied business and social importance (unequaled by any other city in the country) demand that it should have not merely an equal proportion, but a use of telephones at least ten times greater than the ratio of any other city.

Another statistician tells us that less than two per cent of the residences in this metropolis and less than 12 per cent of the business houses have telephones, and yet the company operating here pays its 10 per cent annual dividends, and frequently declares extra dividends. Continuing with the illustration we learn that rates of service in this city, with no competition, range up to 12½ cents per call, and seldom, even on the largest contracts, fall below six cents. A very careful estimate shows that the present or a new Independent company could do business in this city profitably at 5 cents to 2½ cents per call. These lower figures, it is interesting to learn, are based upon the employment of apparatus performing a far larger percentage of the work automatically than is now employed by the present company.

There is talk of an Independent telephone line in Omaha, and the Bell people are using a whole lot of printers' ink to convince the people that it will be a bad thing. Competition always looks bad to a monopolist.

International Electrical Congress

ONE of the most notable gatherings brought about by the St. Louis Exposition was the International Electrical Congress, held in that city September 12 to 17, inclusive. It not only numbered among its attendants many electrical men and scientists from this country and abroad, whose works have made them world-famous, but hundreds of others prominent in their chosen field and whose achievements along electrical lines have won for them more or less celebrity. It has been pronounced the greatest and most important assemblage of its sort ever held, either in America or Europe.

Nearly 2,200 acceptances were received in response to invitations to attend the Congress. Of this number over 1,700 were from men representing every branch of electrical industry in the United States, other countries contributing about 500. Of these 1,700 paid the fee and were enrolled as members of the Congress, and during the week it was in progress the number of those in attendance included a

GROUP OF DELEGATES TO THE INTERNATIONAL ELECTRICAL CONGRESS, ST. LOUIS, SEPTEMBER 12-17.

majority of those who sent acceptances. Besides the large number of delegates from this country, Great Britain, France, Germany, Japan, Italy, Sweden, Norway, Spain, South Africa, Mexico, Brazil, Switzerland, Argentine Republic, Australia, India and Austro-Hungary, as well as other foreign countries, were well represented.

The Congress was held in the Music Hall of the Coliseum, at Thirteenth and Olive streets, the meeting place being an excellent one for convention purposes. After the opening session the Congress was divided into sections, each presided over by a chairman, the members of each section at various times during the week listening to papers of particular interest to them. In all nearly 200 papers were read treating of every phase of applied electricity. Of this number fully a score had a direct bearing on telephony, and were included in the deliberations of Section G—Electrical Communication. The chairman of this section was

F. W. JONES, CHAIRMAN.

F. W. Jones, and the secretary, B. Gherardi. The programme in full follows:

"Electric Communications in Spain". Senor Don Julio Cervera Baviera
"The Present State of Wireless Telegraphy". Dr. J. A. Fleming, F.R.S.
"A New Danger to Lead Covered Aerial Telephone Cables"....
.....John Hesketh
"Simultaneous Telegraphy and Telephony".....Herr Joseph Hollos
"Telegraphy and Telephony in Japan".....Saitaro Oi
"System for Producing Continuous Eelectrical Oscillations".....
.....V. Poulsen
"Theory of Telephone Exchange Development"..M. G. de la Touanne
"Modern High Speed Printing Telegraph System".....J. C. Barclay
"Wireless Telegraph Receivers".....Dr. Lee De Forest
"Rapid Telegraphy".....Patrick B. Delany
"The Telephone Problem in Large Cities".....Franz J. Dommerque
"Wireless Telegraphy".....Reginald A. Fessenden
"Loaded Telephone Lines in Practice".....Hammond V. Hayes
"Features of the Dunbar Two Strand Common Battery Systems"
.....J. C. Kelsey
"High Frequency Telephone Circuit Tests".....Dr. A. E. Kennelly
"Problem: Automatic vs. Manual Telephone Exchange".....
.....Kempster B. Miller
"Printing Telegraphy".....Dr. Louis M. Potts
"Military Use of the Telegraph, Telephone and Cable".....
..... Colonel Samuel Reber
"Electrolysis of Underground Conductors"...Prof. George F. Sever
"Economical Features in Modern Telephone Engineering".....
.....L. W. Stanton
"The Theory of Wireless Telegraphy".....John Stone Stone

The Congress assembled on Monday, September 12, at 10 a. m., over 500 persons taking part in the opening session. Professor Elihu Thomson, past president of the American Institute of Electrical Engineers and president of the committee of organization for the Congress, occupied the position of presiding officer and called the assemblage to order, introducing President David R. Francis of the St. Louis Exposition, who welcomed the delegates in the following words:

As president of the Universal Exposition, now in progress in

B. GHERARDI, SECRETARY.

St. Louis, I have been asked to extend to you a welcome to this city. I appreciate the honor very highly, and regret that my engagements are such that I cannot remain with you during your entire session of to-day, and, in fact, during all of your sessions to which I might be granted admission. The character of this international congress is such as to commend it not only to the greatest consideration of the mangement of the Universal Exposition, but also to the municipality of St. Louis, our state government, and, I might say, the national government also; because our government has recognized this congress, as have the governments of many foreign countries, by appointing delegates to represent it.

This Universal Exposition, gentlemen, is a very ambitious scheme, as you know. Any assembling of the best products of the human race in any special line of human endeavor is ambitious; but when an undertaking is planned to comprise the assembling of the best products of every line of human endeavor it is almost colossal in its proportions. We who have been engaged in this movement from its inception have seen it grow in its plan and scope from week to week and from day to day, and we must confess that at the beginning we hardly realized the magnitude of the work. It would be presuming upon the part of the management for us to attempt to

prejudice you as to the character and comprehensiveness of the exhibits that have been assembled at this exposition. We leave it to you to pass judgment yourselves upon the exposition when you have given as much time to the inspection of the exposition as your engagements will permit. I think it will be a long time, in this country at least, before another universal exposition is attempted. There will of course be international expositions in special lines, and the line which you represent is the one in which there is likely to be another international exposition before a great many more years have rolled by. The great advances which have been made in the science to which you have given allegiance has rendered more than interesting any assembling of the different appliances and any demonstration of the different inventions and discoveries that have been made by the members of this congress or by the members of the allied organizations.

There was some argument, if I may term it such, in the organization of this exposition as to whether electricity was entitled to recognition as a separate department. There was a claim made by the Department of Machinery that electrical appliances, when made instruments of utility, became machinery and consequently belonged in the Department of Machinery, and that there was no more occasion or necessity for a department of electricity than for a Department of Steam. I believe that those of you who will see the Department of Electricity which has been installed at this exposition will admit that the action of the administration of the exposition in determining that electricity should not only be a separate department, but should have the exclusive use of a large exhibit palace, was a wise conclusion.

It would be presuming on my part to attempt to dwell on the advances that have been made in electricity in recent years in addressing such an audience as this. I am sure, however, that you will pardon the presumption in a layman, if you may so consider it, when he expresses the opinion that the development in this line has hardly begun. The installation in the electrical department in this exposition is, in the judgment of the management, superior to any installation that has ever been given in any exposition. It is the result of the very faithful and intelligent efforts of the chief of the Department of Electricity. In so comprehensive an organization as a universal exposition you can readily understand that there must be a number of men who are trusted to do a great many things without consulting any higher authority.

The organization which has brought about this exposition has been in existence about five years. This work dates back five years —dates back six years, I may say, from the inception of the movement, but the first three years of that time were devoted to promotion work, so that the organization of the company proper does not date previous to March, 1901. For three years previous to that time there were some of us in this city who were agitating the question of the celebration of a great event in the history of the United States. That took shape in the form of an exposition. After Congress had recognized this celebration by appropriating five million dollars to aid in its inauguration, a local company was formed, which company had charge of the movement from that time forward. In organizing the local company the work was divided into four great divisions—Division of Works, Division of Exhibits, Division of Publicity and Promotion or Exploitation and the Division of Concessions and Admissions. The Division of Exhibits is under the control of a director, under whom are fifteen chiefs of departments. We congratulate ourselves on the classification of these exhibits. You gentlemen, who are readers and thinkers, know how difficult it is to make a comprehensive classification, and a working classification, that will include all of the products of all of the civilized countries on the globe. One of the departments of that Division of Exhibits—one of the great departments of that classification—is electricity.

We might call electricity the new science. The discoveries that are being made in it from day to day will no doubt necessitate another classification or sub-classification before another exposition is held, whether that exposition will be universal or an international exposition of electricity.

The wisdom that has been exercised by the organizers of this congress and by those who have kept it in existence from year to year indicates a great breadth of view and a remarkable foresight in regard to the development of electricity. The different branches of this congress all demonstrate how far reaching are the discoveries in electricity.

St. Louis is glad to be made the scene of your congress. The exposition management feels honored that the time and place of your meeting should have been influenced by the preparations that were made by the exposition for the purpose of bringing together the best products of all the peoples of the world. Permit me on behalf of the exposition management to express the hope that your deliberations may come fully up to your expectations; that you may visit the exposition exhibit of electricity; that your gathering here may be prolific not only of pleasure to yourselves, but that it may result in still further advances in the line of progress which you have pursued with such remarkable vigor and success during the last decade. I would that I could stay and listen to the remarks that I understand will be made by the members of your organization, but an engagement for an hour which is already passed, to open a congress on the grounds of the exposition compels me to take my departure. I, therefore, will close by again thanking you for meeting in St. Louis, and by expressing to you the hope that you may visit the exposition as often as your engagements will permit, that you will remain with us as long as you possibly can and that when you return to your homes the recollection of this exposition may induce you to come again yourselves, and to advise all of your friends to visit us. I thank you, gentlemen.

Professor Thomson followed with a statement for the committee of organization, as follows:

It is perhaps well at this time to recall a little of our past history. The four hundredth anniversary of the discovery of America was celebrated in 1893 by the establishment of a great exposition. The Chicago International Electrical congress, the work of which is doubtless familiar to many of those present to-day, was the first great gathering of electrical students and workers held in the western hemisphere. A little over one hundred years ago the then youthful but ambitious republic of the United States of America acquired from France, by the expenditure of $15,000,000 purchase money, the possession of an enormous territory extending from the shores of the gulf of Mexico, west of the Mississippi river, northward and westward to the Pacific coast. The northern limit was undefined, and was settled long after by treaty with Great Britain. The tract includes every variety of farm land, forest, semi-arid and arid land. Much of the arid land is amenable to irrigation. The agricultural and mineral wealth is beyond estimation. The Louisiana purchase must be regarded as an event not less important than any other in the history of this great nation, fitly to be celebrated after 100 years by a great exposition, showing the results of human activity and progress in the arts, sciences and engineering—and, I might add, especially in electrical science and engineering—the first in the new century just begun.

It was natural that an international electrical congress should have been deemed desirable. Accordingly a committee of organization was called together by the exposition authorities. The committee in undertaking the work realized the task was not a light one, and invoked the aid of the American Institute of Electrical Engineers and the other societies which have affiliated themselves with the congress. The work of the committee of organization is completed by this meeting, and the choice of permanent officers is now in your hands. I cannot close this short statement without a warm tribute to the work of the secretary, Dr. Kennelly, who has given time and effort without stint to every phase of the development of the congress. Neither can I fail, also, to remind the congress that the diligence, care and good judgment of the treasurer, Mr. Weaver, of the *Electrical World,* have been invaluable. He has been a pillar of strength at all times. I wish also to express our deep sense of the assistance and encouragement arising from the assurances of co-operation received from the various scientific and technical bodies which are represented here to-day.

The next speaker was R. Kaye Gray, president of the Institution of Electrical Engineers of Great Britain, who responded on behalf of the British Institution to President Francis' address, as follows:

We have all heard from President Francis as to the objects of this great exposition. For my part, I may perhaps state to you that we, the Institution of Electrical Engineers of Great Britain, felt very much pleased when we received the invitation to go to St. Louis and to take part in the electrical congress. This pleasure was made all the greater when we received from our colleagues on this side of the Atlantic the American Institute of Electrical Engineers, a cordial invitation to come to their country, and an assurance from them that we would receive a hearty welcome, and that they would charge themselves with looking after our welfare during our sojourn in your country.

There is another pleasure which we have experienced here since our arrival, and that is that we have met our colleagues from Italy. I had the extreme pleasure in the spring of last year to visit with our institution the north of Italy and to see the work which was being done there. I met my friend, Professor Ascoli, whom I am very glad to see is leading the Italian contingent, which has also crossed the Atlantic to visit your shores and has also received the hearty welcome which you extended to us all upon the occasion of our trip to Italy last spring.

When we arrived here and had placed in our hands the programme which you had prepared for the congress—I think that never in this world has such a programme been laid out before, I won't say for an electrical congress, but I will go further and say that a programme such as this has never been before laid out for any congress of any nature whatever, which is at all a special one—we were still further pleased that we had arranged to visit your shores and take part in the congress. Those of us who have at various times during our career had occasion to organize meetings, though of very much smaller proportions than this congress, can very well appreciate what an enormous amount of labor has been expended by our kind friends on this side to organize such an extensive programme as is now laid before us. We have heard from President Francis, and

we have heard from Prof. Elihu Thomson how much Dr. Kennelly and Mr. Weaver have done; but I think, now that we are here, and I have command of the platform, you will allow me to break through that veil of modesty which is so well known in Prof. Elihu Thomson and to give him his due meed of praise. I see, gentlemen, by your applause that the venture I have made has been a perfectly justifiable one.

I do not know that I should occupy your time any longer, because our good friend, Professor Ascoli, is going to have the pleasure of addressing you, but before taking my seat I wish to say, in the name of the Institution of Electrical Engineers of Great Britain, how warmly we feel toward you all in this country. I wish to say what great admiration we have for you. I cannot speak of St. Louis, of course, because we only arrived yesterday afternoon; but perhaps before this congress closes some of us will have had time to appreciate the result of the work of your committee of organization.

Professor M. Ascoli responded for Italy in the following words, speaking in English:

I have the honor, which I highly appreciate, to reply in behalf of the Italian delegates to President Francis, to Professor Thomson and President Gray, who have all had such kind words to say to our delegation from Italy. It is really an exceptional fact that so considerable a number of Italian engineers should join in a visit to this country. I think it is the first time that such a large delegation of Italian engineers has visited the United States. We have already had a splendid proof of the great hospitality and of the sentiments of friendship from the Americans who have entertained us in the last few days. We had the opportunity of seeing and highly appreciating the great results of organization, which is a special characteristic of the American work. We heard from President Francis the history, I dare say, of the organization of the exposition. We had from President Thomson an idea of the work done in the organization of this congress and we are sure that with such an organization the work of the congress must have the most important results. I cannot speak in the English language as clearly as it would be necessary for me to do to express the sentiments of the Italian delegation for our American brothers on this occasion. But I hope to interpret the sentiments of my Italian colleagues to an extent sufficient to convey to you our hearty thanks for your kind welcome and our appreciation of the hard work which has been done in the organization of this congress, and especially to Professor Thomson, Dr. Kennelly and Mr. Weaver.

At the conclusion of Professor Ascoli's talk, Professor Thomson said:

We are happy in the example set by our British and Italian colleagues; and in case we ever hold another exhibition and congress, we hope their example may be followed by other nations. We hope that our colleagues in France may be induced to send equally large or larger delegations. There are other countries, too, which might easily send delegations when they get into the spirit of it. You know, however, the traditional unwillingness of the Frenchman to leave his home and fireside and travel in foreign lands; but it so happens that we have with us one representative of the great republic of France, and I have pleasure in calling upon Mr. Guillebot de Nerville, to speak, not only on behalf of France, but on behalf of other nations which may be represented here to a greater or less degree.

M. de Nerville then addressed the meeting in French, speaking in behalf of other foreign countries as well as his own, and expressing his great pleasure at being in attendance on the Congress.

Professor W. E. Goldsborough, chief of the Department of Electricity at the exposition, extended a welcome on behalf of the electrical men of St. Louis. He said:

I cannot tell you with what pleasure I welcome you to St. Louis, on behalf of the electrical men of St. Louis. We feel that in coming here and in meeting with us you have brought to us the one gift which we have prized more than all else in connection with the exposition. It is not fair to say that the exposition management is in anywise responsible for any achievment in electrical engineering which you may find at the exposition; it is only fair for me to say that an international electrical congress which has been directing and working to a far greater extent possibly than any of us here have knowledge of, during the preceding months, has organized and placed at the exposition a demonstration of what has been accomplished in the field of electrical engineering, which is a physical embodiment of the effort of the congress, and I say of the congress advisedly; because the men, the brains and the muscle, the enthusiasm, which has gone into the work at the exposition have come from you. In Machinery Hall you will find large direct-connected generating sets of very advanced type, many of them complete installations, and in the Palace of Electricity small apparatus, apparatus which bears more particularly upon the scientific and physical side of our work. On the exposition grounds there is an illumination which some have been pleased to say is a very beautiful thing, and which has been brought to its state of present perfection, as regards its conception, by Mr. Henry Rustin. In all of these things we have worked with what you have placed in our hands. There is now opening here, in this congress, as I look at it, the work which will represent the mental concept of what has been placed on the exposition grounds in its physical aspect.

During the months that have gone by it has largely been the knowledge of the fact that you would be with us to enjoy the electrical features of the exposition which has inspired us to put forth our best effort to make preparation for your coming. I want to say, on behalf of the exposition management, that President Francis, Mr. Skiff, the director of exhibits, and Mr. J. E. Smith, chairman of the electricity committee, have given me such support as I doubt any man might fairly have expected to receive from his superior officers; and anything which you do not feel that you can take to yourselves I hope you will credit to them, as between you lies what credit there is for what has been done.

Naturally the American engineers have appreciated more than words can express the effort that has been made by our foreign friends to meet with us and make our meeting here a truly international one in the broadest possible sense. We know of the measure of fatigue they have had to withstand, and how much they have been inconvenienced by having to focus their time on a very distant city without reference to their own convenience, inasmuch as this congress was organized and had to be organized without special reference to the desire of individuals. The fact that they are here in such large number is greatly appreciated, and I think tells the story better than it can be told in any other way of the fine co-operative spirit which has animated electrical workers since its inception. We have probably a better nomenclature, we have probably more uniform standards, and have our work systematized for making it of accurate record and for passing it between men of different tongues than has any other division of human endeavor. It is a matter upon which we must congratulate ourselves, and I am quite sure as the result of your work here that we will go forward during the next decade much better equipped than the electrical fraternity has ever before been for the task before us. I thank you very much for the opportunity of extending to you a welcome on the part of the electrical men of St. Louis, and trust your visit may be one of pleasure and profit.

On recommendation of the committee, headed by Major Reber, these officers of the Congress were elected:

President—Elihu Thomson.

Secretary—Dr. A. E. Kennelly.

Treasurer—W. D. Weaver.

Vice-presidents—Bion J. Arnold, Prof. H. S. Carhart, Prof. W. E. Goldsborough, C. F. Scott, Prof. S. W. Stratton.

Section A, General Theory.—Chairman, Prof. Edward L. Nichols; secretary, Prof. Howard T. Barnes.

Section B, General Applications.—Chairman, Prof. Charles Proteus Steinmetz; secretary, Prof. Samuel Sheldon.

Section C, Electrochemistry.—Chairman, Prof. Henry S. Carhart; secretary, Carl Hering.

Section D, Power Transmission.—Chairman, Charles F. Scott; secretary, Dr. Louis Bell.

Section E, Electric Light and Distribution.—Chairman, John W. Lieb, Jr.; secretary, Gano S. Dunn.

Section F, Transportation.—Chairman, Dr. Louis Duncan; secretary, A. H. Armstrong.

Section G, Communication.—Chairman, Francis W. Jones; secretary, Bancroft Gherardi.

Section H, Electrotherapeutics.—Chairman, Dr. William J. Morton; secretary, William J. Jenks.

On the recommendation of Professor Carhart's committee the following-named gentlemen from abroad were elected as vice-presidents of the Congress: Professor Ascoli, Colonel Crompton, Dr. Glazebrook, Gonzalez Gray, Lombardi, Perry, Poincare. For the honorary chairmen and vice-chairmen of the sections these were chosen:

	Honary Chairmen.	Vice Chairmen.
Section A.....	Arrhenius.	Lash-Miller.
Section B.....	Grassi, Zipernowsky.	Duddell, Weber.
Section C.....	Ostwald.	Dennery.
Section D.....	Janet, Maffezzini.	Jona.
Section E.....	Otamendi.	Newbery, Arizpe.
Section F.....	Ferstel, Sandick.	Latour.
Section G.....	Hesketh, Harrison.	Ferrie, Shields.
Section H.....	Bergonie.	de Nerville.

In accepting the presidency of the Congress Professor

Thomson made an address that, though brief, was scholarly and to the point, his words following:

I thank the gentlemen of the congress for this endorsement of what has gone before. I cannot but feel that in electing the same officers as the permanent officers of the congress, without objection, without even a suggestion on the part of any one of a change in these officers who have served on the committee of organization, that the work of the committee has received your endorsement. We are encouraged by that result. The duties before us will not probably be so arduous as those which are in the past. It is usual on occasions of this kind for the president-elect to make an address. I have a few thoughts to present and without trying your patience too much I will take this occasion to give them to you.

The main object of the congress will have been fulfilled if there is brought out in its papers and discussions the best thought and work in the electrical field. We have no need to dwell here upon the great growth which has taken place and is now going on in electrical science and engineering. True it is that equally rapid advancement may be found in many fields, but electricity is unique in its almost universal character. Not only has it already made great revolutions in methods of lighting, in power systems, in transportation, in communication of intelligence and in many other fields of engineering, but our conceptions of the nature and workings of the forces in the universe, even the nature of matter itself, are and will be profoundly affected. It is too early even to suggest that electricity will be the study of the alchemist of the future.

Research in pure science seldom takes account of engineering and industrial possibilities. It is well that it is so; but from the present standpoint the electric arc of Davy, the voltaic couple, the magneto machine of Faraday, the electric waves of Hertz, as examples, merely show how the results of inquiry undertaken for its own sake may become the bases of enormous industrial development. It is fitting, therefore, that in a body of this kind science and its applications should be united. There is, however, a difference between the work of the pure science investigator and that of the engineer. I regard invention as creative engineering. The difference alluded to is sometimes lost sight of. It touches the matter of responsibility for results. It matters not very much whether the results reached by the former are negative or positive, whether they indicate success or failure to attain expected or unexpected results. Not so with the engineer. If he is to maintain his standing his results must be positive, his work must succeed commercially, industrially and financially. Naturally the engineer receives or should receive emoluments in accordance with the responsibility incurred. As a result the pursuit of science for its own sake may suffer when the scientific investigator takes up engineering. Sometimes it is engineering that suffers. It is a sign of the times that the value of research is becoming so well recognized as an aid to engineering that our large industrial organizations willingly support research work. Naturally preference is given to such new work as promises immediate benefit to the industry. The principle is gradually coming to be recognized, however, that constant additions to knowledge of nature are in themselves valuable and likely at any time to open up new channels of industry. The little streams lead to the rivers and few rivers are without commercial possibilities.

The ethical value of the study of science and its applications is inestimable. By it and through it only will fallacious systems of thought and inequitable precedent finally lose their influence and disappear from the work. Figuratively the honest "cold light of science" is a fact. The firefly exemplifies the actual, physical cold light of the future.

The future of science, and particularly of electrical science, is boundless. The chemist must possibly accept an electrical atom, the physicist an electrical inertia. Since the ether is only known to possess electromagnetic properties, whatever that may mean, matter and all immersed therein may be electrical. Prepare then to accept an electrical universe. "Who shall bring us to see that which may be after us?"

After the adjournment of the opening session of the International Electrical Congress the different sections met in their respective rooms, organized, and immediately began with the reading of the various papers. The first day's sessions were somewhat shortened by the time taken in opening the general congress. Nevertheless a feeling of general activity prevailed and lively discussions were brought forth by a number of papers. In several instances, where advance copies of the papers had been issued to the members of the Congress, the actual reading of the paper was dispensed with, and discussion on the subject immediately taken up, which resulted in a considerable saving of time.

On Monday afternoon the Chamber of Delegates, composed of official representatives from various countries, held a meeting and effected a preliminary organization. At that time the revised list of foreign official and semi-official representatives, present or on the way, was as follows:

Argentine Republic—Dr. Jorge Newbery.

Australian Colonies—John Hesketh, Esq.

Denmark and Sweden—Prof. Svante August Arrhenius.

Dominion of Canada—O. Higman, Esq.

France—Poincare, Guillebot de Nerville, Ferrie, Dennery.

Germany—Litzrodt (to the Congress).

Great Britain—Col. R. E. Crompton, Dr. R. T. Glazebrook, Prof. John Perry.

Hungary—Bela, Vater.

India—J. C. Shields, Esq.

Italy—Prof. Moise Ascoli, Prof. L. Lombardi, A. Maffezzini.

Spain—Miguel Otamendi, Antonio Gonzales.

Switzerland—Prof. Ferdinand Weber.

The chamber organized by the election of Elihu Thomson as president and Dr. A. E. Kennelly as secretary.

Each session of the Congress during the entire six days was well attended and the greatest interest was manifested in all the proceedings. Electricity Day, September 14, was set apart as a sort of a holiday for the delegates and a special and highly attractive programme was carried out for their benefit. Numerous banquets, receptions and entertainments were given also for the delegates.

Appreciating the importance of the papers read in Section G—and particularly those treating wholly of telephony—and their value to those engaged in telephone work, TELEPHONY publishes several in this issue, and hopes to give its readers the remainder in the November number.

NOT THE "ONLY" WAY.

The following communication from J. M. Plaister, the well known telephone man of Fort Dodge, Iowa, touches upon a subject that should interest every telephone manager and is self-explanatory:

In looking through the September TELEPHONY I note under the head "Telephone Insurance" that you say "the only way to insure against a loss of revenue which arises from such a break in continuous service is to pay insurance premiums against it in another form." While I agree with the article, I think it might be of some importance to the broadcast telephone interests to know that it is not the "only" way. Our company carries a regular insurance policy, written by one of the oldest and best known companies in the United States, which is designed to cover completely this very class of loss. I have no doubt that inquiry made to the local agents of any of the large insurance companies would result in the securing of a similar policy by any company that so desires. To be perfectly clear, I might add that this policy covers loss by fire only.

CONSOLIDATION OF LONG-DISTANCE LINES.

Articles of incorporation have been filed at Pierre, South Dakota, for the Dakota Central Telephone Company, with a capital of $5,000,000. This is practically a consolidation of the long-distance lines in South Dakota under one management, and includes also lines which reach into Minnesota, Iowa, Nebraska and North Dakota. Arrangements have been concluded for acquiring most of these lines, the principal stockholders being stockholders in the new company. When completed, the Dakota Central will be one of the strongest Independent companies operating in the Northwest. Many miles of new lines will be at once constructed and a great many improvements on the present system are contemplated. The directors are J. L. Zeitlow, J. F. Zeitlow, W. E. Bickelhaupt, Isaac Lincoln and C. N. Herrid.

Among other things discovered in the latest batch of Sunday supplements was a statement that a telephone girl can tell all about a man's disposition by the sound of his voice. If the telephone girl is a perfect lady she can't tell all about it, or at any rate she won't.

DEATH OF RICHARD S. WARING.

Richard S. Waring, formerly one of the most prominent citizens of Pittsburg, and the pioneer in the distinctive business of underground cable manufacture in the United States, died on Tuesday, August 23, at Elmira, New York, where he had resided for several years past. Mr. Waring was born in Saratoga county, New York, in 1833, and came to Pittsburg to begin his business career in 1856 or 1857.

His first employment there was as bookkeeper for the Citizens' National Bank of that city, which he served in that capacity for a year; he then entered the employ of R. N. Sellers & Company, manufacturing and wholesale druggists, who, after Mr. Waring had been with them for about a year, built one of the first oil refineries on the Allegheny river near Sharpsburg, and made Mr. Waring manager of the refinery. In this way Mr. Waring acquired his first experience in the oil business, which was then a comparatively new industry.

In the winter of 1861-2 he formed a partnership with a man named Gregg, under the firm name of Waring & Gregg, and engaged in the petroleum oil brokerage business. That partnership continued about two years, when Mr. Gregg retired on account of ill health, and Henry King of Pittsburg succeeded him in the partnership, under the new name of Waring & King.

On January 1, 1865, Mr. Waring's brother, Orville T. Waring, was taken into the firm and had charge of the

RICHARD S. WARING.

Philadelphia branch, under the firm name of Waring, King & Company. About 1870 Mr. King sold his interest to Richard S. Waring, and the firm name was then changed to Waring Brothers in Pittsburg, and Waring Brothers & Company in the east, where they had important branch offices, warehouses and docks in the three principal cities of New York, Philadelphia and Baltimore.

Mr. Waring's energy and enterprise soon gave him a leading position in the oil business, and he was at one time one of the most prominent independent oil refiners of Pittsburg, and one of the bitterest and most noted competitors of the Standard Oil Company. His firms operated the Vesta oil works and the Cosmos Oil works directly, and financed a great many other refineries and operated them under lease or controlled their entire output. All of these refineries were in western Pennsylvania, and most of them on the Allegheny river and Allegheny Valley Railroad near Pittsburg; the Vesta and the Cosmos oil works were at Waring Station just above what is now known as Brilliant Station on the Allegheny Valley Railroad. The Vesta oil works was very complete—in fact, the model refinery of that day—and a great deal of experimental work was done there. Their business in the United States and abroad was very extensive and successful, so that Mr. Waring amassed quite a large fortune.

On January 11, 1875, the suspension of Waring Brothers was announced, and it was then claimed that it was due to discrimination in freight rates. Their refineries and properties were absorbed by the Standard Oil Company. Subsequently, suits were entered against the Pennsylvania Railroad Company asking for damages in a large amount, resulting from the rebates alleged to have been given to the Standard Oil Company, out of overcharges to the Independent firms.

Mr. Waring was also prominent in the social and political life of Pittsburg and was for a number of years chairman of the Republican county committee and was one of the close personal and political friends of the late Christopher L. Magee. One of the largest and most enduring achievements of Mr. Waring, and which must always remain a monument to his genius and foresight, as well as to his energy and perseverance in the face of many difficulties and discouragements, was the founding of the Standard Underground Cable Company by him in 1882, a company which has become one of the most prosperous manufacturing corporations of Pittsburg, and one of the most successful in its line in this country. His knowledge of the oil business was extremely useful to him in perfecting his cable system, for it suggested to him, and enabled him to produce, the most valuable insulating compound from petroleum products; and upon this insulating compound and numberless other features of cable manufacture, he promptly secured letters patent, both in the United States and in all important foreign countries.

Although there was no demand or market for underground cables in this country when Mr. Waring founded his company, and although for a number of years thereafter he had to contend with the bitterest opposition from the operating electrical companies to which he must look for business, he nevertheless courageously and unstintedly spent his time and money in perfecting his cable system and its manufacture, and he lived to see the day when his company was firmly established in the business and its products considered an indispensable necessity.

In 1887 Mr. Waring went to England and founded the Fowler-Waring Cables Company, Limited, for the manufacture of cables of the same type as were made by his American company. After remaining in London until 1890 he spent about two years in France, principally in Paris, and then returned to Pittsburg in 1893. He then interested himself in the Susquehanna Water Power Company, a project intended to utilize the waters of the Susquehanna river for electric power, but about five years ago he was obliged to retire from active business on account of failing health, and had since then resided at Elmira, New York.

He was a member of the American Institute of Electrical Engineers for a number of years; for many years he was a trustee of the Western University of Pennsylvania, a director of the Morganza Reform School of Western Pennsylvania, and a trustee of the First Presbyterian Church of Pittsburg. He was a broad-minded man, of liberal attainments, kind-hearted, and responsive to the appeals of worthy enterprises, many of which have reckoned him among their benefactors.

He is survived by his wife, his son, Tracy D. Waring (assistant superintendent of the Perth-Amboy cable works of the Standard Underground Cable Company) and daughter, Mrs. James Robinson; his brothers, O. T. Waring of the Standard Oil Company, and E. J. Waring of the Standard Underground Cable Company, and his sister, Malvina Waring of Plainfield, New Jersey.

The funeral services, held in the chapel of the Third Presbyterian Church in Pittsburg, on Thursday, August 25, were largely attended by his former friends and acquaintances, and the remains were interred in the family lot in Allegheny cemetery.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

Telephone Exchange Engineers—MANSON.—*Libby and Simpson, Telephone Journal September 10.*

GENERAL TELEPHONE ENGINEERING.

The condenser is a piece of apparatus for storing electric energy in the form of a static charge. It consists of two plates or sheets of metal separated by some insulating material. The water or liquid analogy which has been found so convenient for explaining certain electrical actions, is used by these authors in explaining the action of the condenser. The drawings are excellent, and the explanation is clear. A sharp distinction is made between the action of the condenser in an alternating current circuit and in a direct current circuit, the water analogy being applied to each. The units of capacity, the relation of condensers in series and in multiple, and formulae for capacity calculations, are very clearly described. The relations of frequencies to condenser reactance are simply and plainly given.

The Telephone—TAYLOR.—*Sound Waves, September.*

The eighth article of a series, and deals with arrester equipment. Many drawings illustrate the relation of the line and ground conductors of open-space cutouts of the metal and carbon types. The best conditions in the latter case require that the carbon surfaces be rough. One of the present disadvantages of carbon arresters is that while they are efficient, the grounding of the line at one station may put all the other stations on that line out of service. Ground wires should be as straight as possible and contain no spirals. This is because the impedance of spirals and turns and twists in the ground wire is highly effective in choking back lightning discharges. As the impedance is greater when the frequency is greater, such twists and turns in the wires will affect lightning while they may not affect speech. A further part of the installment is devoted to description of the circuits of the ordinary substation instruments, and the causes and effects of various troubles.

First Telephone Exchange—BAKER.—*Sound Waves, September.*

The first telephone exchange switchboard was set up at New Haven, Connecticut, in 1878. A switchboard was installed in Meriden, Connecticut, immediately thereafter, and a picture of the switchboard is reproduced. The device is well named, because it is a mere board with a few switches on it, and was arranged to accommodate eight lines. Two of the oldest telephone directories ever printed are reproduced in the article.

Loaded Telephone Lines in Practice—HAYES.—*Proceedings of the International Electrical Congress.*

The distortion due to reflection losses in a loaded telephone circuit can be eliminated if the coils are so spaced as to give at least 7,000 coils per second, and if this spacing is uniform. In a number of interesting and instructive curves, the author illustrates the results which have been obtained on several typical commercial circuits, all comparisons being made on the basis of relative attenuation between similar circuits loaded and unloaded without reference in any way to distortion or the quality of transmitted speech. Similar figures illustrate the results obtained in tests of a heavily loaded standard telephone cable. These cables are composed of No. 19 B. and S. gauge wire, such as is used for subscribers' lines in large exchanges, or trunk lines between several offices. In larger cities some of these trunk lines are very long, having lengths up to 20 miles or so. Whatever may be the equipment, conversation between the subscribers in exchanges so far apart, is difficult, to say the least. The application of loading coils to these long trunk lines has assisted greatly in bringing such offices telephonically near together, and there are cities yet unprovided with loaded trunk lines, which might wisely be so equipped. In some of the tests on actual cases of this kind, the effectiveness of the loaded lines has been found to be almost twice as great as that of the same lines when unloaded. It is worthy of note that this improvement in trunk lines is constant, not being changed by any conditions of weather, temperature or season.

In loaded aerial lines, such uniform success has not been achieved as in underground trunk lines. In fact, the condition of the atmosphere has been found seriously to change the effectiveness of the loading, so that it is yet an unsettled question whether loading is a commercial success in open copper wires. At the best there is not the same improvement in the quality of transmission on the loaded aerial circuit as compared with its unloaded condition, as is true in cables. It would seem that there is still a field of work of immense benefit in the devising of a distortionless circuit for long distance purposes, which may be enclosed in a sheath or even be laid underground.

Peculiar case of Induction—RICH.—*Telephone Journal, September 17.*

In a system having a common return wire, peculiar noises are observed in the operator's telephone circuit when it was not connected to any line. An alternating electric light system existed. Investigation proved that one of the transformers of the light system was wired so as to connect its primary and secondary together, one side of the primary being grounded. When this trouble was cleared the switchboard circuits were free from noises.

Telephone Problem in Large Cities—DOMMERQUE.—*Proceedings International Electrical Congress.*

Due respect should be paid to the quality of service, and the introduction of trunking between offices is a count against speed of completing connections, so that in that particular a one-office arrangement is preferable. Twenty thousand lines, however, are as many as can be placed in a subscriber's switchboard of the single-division system, so that unless two-division, or similarly divided switchboards are used, more than one office will be necessary in a town of more than 20,000 lines. There are difficulties in the use of division switchboards, however, and these are pointed out. One of them is the placing of special work upon the subscriber, not necessary in the ordinary manual system. This is not so great as is true in the automatic working, but still it is a count against that form of manual working. The author concludes that the quality of service deteriorates with the increasing percentage of trunking. In the automatic system, however, in which trunking is an ever present element, the quality of the service is not affected, so that the author concludes, without definitely saying so, that it is not trunking in itself which hurts the service, but the particular form which he had in mind. The use of composite telephone and telegraph circuits effects a considerable economy in toll line working.

Telegraph, Telephone and Cable in War—REDER.—*Proceedings International Electrical Congress.*

Napoleon said, "The secret of war lies in the secret of communications." In every time much of the success of a campaign has depended upon communication between headquarters and the arms of the active army, and between the latter themselves. Electrical communication by means of

the telegraph and the telephone has enabled strategy to be exercised in a form not possible before. Some modifications of the telegraph are of extreme convenience in warfare, although not useful in ordinary commercial work, These, and other interesting historical matter, are recorded by Col. Reber. In the South African and Spanish-American wars, a number of critical situations were solved by means of communication; and in the present war between Russia and Japan, the value of the telegraph with and without wires, and of the telephone system in the field and in camp, has been repeatedly proven.

Two Strand Common Battery Systems—KELSEY.—*Proceedings International Electrical Congress.*

The author reviews in an interesting manner the line of invention and application pursued by the engineers of the Bell company in developing common battery systems to the point of present practice. His assignment of reasons for the various steps is logical. He points out the steps taken by the Independent engineers in attempting to improve upon the conditions which they found and to avoid interfering with the inventions of others. It is his conclusion that a substantial contribution to the arts was made by the development of the two conductor system of switchboards, which system he illustrates and describes in detail, and the credit for which he assigns to Mr. Dunbar.

Small Ground Wires—NICHOLAS.—*Telephone Magazine, September.*

It is to be impressed upon those having to do with exchanges that a good earth connection is of great importance, and that the protective system depends in a large degree upon the central office ground for its efficiency. The author gives data for finding out the right size of the ground wire, and tells how to secure good connection with the earth.

Simultaneous Telephony and Telegraphy—HOLLOS.—*Proceedings International Electrical Congress.*

Such a combined use of lines is not new. In Hungary simultaneous working is successfully carried out, the Wheatstone bridge principle being the basis rather than the method which utilizes the different frequencies of the two systems as a means of discrimination. Repeating coils having short cores and preferably open magnetic circuits are recommended by the author. He reports that speaking and signaling over the composite telephone circuits are both commercial and satisfactory with the arrangement in question.

The Telephone in Warfare.—*Electrical Age, August.*

In keeping with their most remarkable thoroughness in details of field work, the Japanese have equipped their army detachments not only with conveniences for stringing out telephone lines of considerable length, but with apparatus for establishing complete temporary exchanges on making camp. These camps are usually connected with the seashore headquarters, and these by wireless telegraph with the general headquarters and with the fleets. No part of the army is ever out of touch completely, and in a large measure Tokio is in communication with every detachment.

Traffic Design of Central Office Switchboards.—*Am. Elec., September.*

Telephone switchboard design covers two principal features; one having to do with the circuits, the wiring, and the apparatus as to character, and the other having to do with the capacity and type of the equipment as dictated by the traffic which it is proposed to handle. Circuits in general have become relatively standard. It is stated that three years is the usual period for which equipment is provided. The most valuable source of information in designing an equipment for a new territory is a comparison with similar localities: from the expected classes of service, number of stations, number of lines, and probable calling rate, the design may be begun. Accurate periodical records of the growth of the exchange and its traffic are quite indispensable in undertaking to make layouts for new work. Whether the contracts will call for flat rate, unlimited service, message rate, limited service; or prepayment from pay stations, is important to be determined reasonably well in advance, as the amount of traffic to be handled per unit of the switchboard is covered in this way. The total number of calls originating in a given district in a system having more than one office, will divide in some proportion between all the offices of the system, and some assumption in advance as to how this division will take place is necessary to enable the work to be done with any sort of accuracy. Where the traffic warrants it, trunks between offices should be on the one-way plan, that is, trunks over which no ringing or talking is done by the operators, calls being transmitted over special order circuits and over which trunk connections are always made by the subscriber's operator at one end and by the trunk operator at the other.

Maintenance—BENSON.—*Telephone Journal, September 3.*

The first article of a series. Without treating the cost of maintenance, the author deals with the classification of troubles usually found in exchange systems, and with the mechanism used to locate these troubles.

Maintenance—BENSON.—*Telephone Journal, September 10.*

The second article of a series. The most natural method of locating a break in a line having many stations, is to determine which stations can be called and which cannot. Much time can be saved in these days by the application of experience and of a concise knowledge as to just where each line is most exposed to trouble. Short circuits can best be discovered in the absence of galvanometer or similar methods, by opening the line at successive points until the trouble is discovered or found to be passed. Crosses act to make lines noisy, and their location can often be discovered by listening on the line. Ringing tests also assist in locating crosses. Grounds can be located by opening the line from point to point, and in all the methods time may be saved by testing for the most likely locations first.

The Telephone and the Electric Railway.—*Street Railway Journal, September 3.*

It is worth while for electric roads to take a leaf from the book of the steam railroads, which generally spare no pains to keep their communicating system in good condition. In such instances of electric roads as have utilized the telephone, the equipment and lines have received scant consideration, as to the smaller elements of convenience. A traction plant of large capacity, with great possibilities of accident and delay, deserves a better telephone equipment than a single instrument mounted on a second story switchboard in an inaccessible position. Much advantage in the way of limiting the time of blockades may be gained by making the telephone service easily accessible to train crews.

Telephone Engineering—KELSEY.—*Electrical Review, August 27.*

The tenth installment of a series. This installment is devoted to a description of the Kellogg system of trunking between offices, the circuit in question involving the use of a repeating coil in the trunk, co-operating with cord circuits having condensers and retardation coil relays. Associated with the group of trunks leading to one incoming trunk operator at the distant office, is an order circuit, or call circuit, over which the subscriber's operator speaks to the incoming trunk operator. The number thus called over the order circuit has the plug of one of the trunks inserted in it if it is not busy, that trunk being designated by its number in words, back over the called circuit to the calling subscriber's operator, and connection with one of the multiple jacks of the designated trunk is then made by the subscriber's operator, who thereafter controls the connection except as to ringing. Ringing is under the control of the trunk operator and in some phases of the circuit is accomplished by automatic means. Associated with the equipment are arrangements for signaling back to the calling office in case the desired line is busy. In general the system is similar to that of the Bell company which is in general use.

Submarine Telephone Cables.—*Editorial London Electrician, September 2.*

The essential difficulty in telephone working over submarine telephone lines is that they possess greater capacity

LINES AND LINE CONSTRUCTION.

and smaller inductance than land lines of corresponding length and resistance. Heaviside in England, Pupin in America, and Dolzalek and Ebeling in Germany, have shown by theory and practice that success must come by increasing the inductance and decreasing the capacity, or perhaps nullifying the effect of the latter by adding to the former. Inductance has not yet been introduced into any commercial line by a method which distributes it uniformly throughout the circuit. Such distribution has been approximated with beneficial results; but the inductance coils are of such size that it is not easy or convenient to put them into or associate them with submarine cables. German engineers have devoted their attention to modification in the construction of the cable. The reason submarine cables have such high capacity is the use of rubber or gutta-percha for insulating purposes. The latter gives higher capacity even than the former, and this a higher capacity than the materials used in telephone cables laid underground. We do not yet know whether lead covered, paper insulated cables can withstand the conditions of deep sea working. This article pleads urgently for experimental trial of the inserted-inductance method, and suggests the use of a single conductor instead of a metallic circuit in the submarine section of a long cable. The proposition is to carry the shore ends out as metallic circuits, inserting repeating coils at points considerably distant from the shore, and keeping the capacity of the single wire down as low as possible by including paper insulation within an outer covering of gutta percha or rubber. It is impossible to avoid admiring the suggestion, which seems to have in it elements of good sense; unless the ocean bed were to be laid with many such cables, there is reason to believe that a single wire section of this kind would be free from disturbances of any hurtful amount. It is definitely true that immense improvements are within our reach as a result of what we know. It is to be regretted that no single interest is bold enough to undertake to solve the matter once for all. The commercial and social benefits of its settlement are bound to be most striking, not so much as to possible deep sea talking, but as to underground land working and high speed submarine telegraphy.

Subway Construction—CRAIG.—*Telephony, September.*

The second article of a series. Conduit material for underground work is a most important feature of selection. Vitrified clay in single and multiple duct, fibre, creosoted wood, cement-lined iron pipe, and single duct conduit made of cement and crushed rock, are those from which one may choose. Iron pipe has the advantage of flexibility, but has other disadvantages. Vitrified clay has satisfactory lasting qualities, and is more extensively used than any other form of material. When in single duct and short lengths, hard clay tile of this kind can be laid very flexibly Multiple duct tile in longer lengths is extensively used. Fibre pipe saturated with bitumen has the advantage of being light, thus saving freights and something of the cost of local handling, and breakage is less than in the case of vitrified tile. In some localities material of this kind might be found distinctly cheaper than clay tile on account of these reasons. Stone conduit and creosoted wood have been used in smaller degree. The latter, when well made, is found to be a lasting material, and it should not as now made affect cables placed in it. Cement-lined pipe has been used to a considerable extent. The making of concrete and cement mortar are described. Eight illustrations assist the description.

Concerning Telephone Lines—MCMEEN.—*Telephony, September.*

The fifth installment of a series, treating insulation tests, and the location of grounds, crosses and opens.

Graphic Right of Way Records—MCMANN.—*Telephone Journal, September 3.*

Right of way records should be laid out on maps, which show the location of each pole, the name of the adjoining property owner, the position of trees, anchors, guy stubs, and by special lines and marks all the necessary facts with relation to the permission obtained and the payment made. An alternative method is suggested, involving the use of cross section paper upon which are located the poles with other principal and necessary information. Both are good, and the adoption of either would save money, annoyance and litigation.

The Use of Instruments in Telephone Testing.—Western Electrician, September 10.

Three figures and a description illustrate the methods of measuring insulation resistance by means of voltmeters, ammeters, and reflecting galvanometers.

Chicago Telephone Tunnels.—Western Electrician, September 10.

The development of the freight tunnel system of the telephone company using the automatic system in Chicago, continues to be pushed. The Illinois Tunnel Company is expending large sums for real estate for warehouses, power houses, and freight yards, and evidently expects to make freight handling a very large feature of its business.

Locating Faults in Telephone Cables—STABLER.—*Elec. World and Eng., August 27.*

By the use of a galvanometer and a Wheatstone bridge, the well known Varley loop test may be utilized to determine the position of a ground or a cross on a cable conductor. The Murray test is simpler, and gives very satisfactory results, and in this system one resistance is varied while another remains constant; and when the galvanometer gives no deflection, the location may be calculated. These methods are capable of being applied to lines in which the wire ordinarily called good has not perfect insulation. A test is outlined in this article, which, by means of current passed out from the point of test, over the wire which is grounded, to the sheath, back to the point of test, over the sheath, is observed by bridging a voltmeter between two points on the cable sheath. If the voltmeter shows a deflection it will mean that the observer is too near the observing point, and must repeat his test farther from the central office. The test requires that the cable sheath be free from ground except at the testing end, and also requires that the conductor under test be actually grounded upon the sheath through a fairly low resistance. A very large current is not required. A quarter of an ampere flowing through the defective wire has been found to give a deflection of 1/10 milli-volt between two points on its surface four feet apart.

Salt Lake City Independent System—TYLER.—*Telephone Journal, September 17.*

This system has recently been opened. The subway construction includes 25,582 feet of trench, carrying about 257,000 feet of duct. In the effort to expedite

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the handling of the cable, a gasoline engine drawing-in system was installed, and its use has been found entirely satisfactory. The outfit operated during severe winter weather, to pull in over 7,500 feet in eight and one-half hours, ten men being used. It is believed that 18,000 feet could be installed in eight hours with a similar outfit, and a proper gang of men. No aerial bare wire has been used in the construction of the city plant. In the aerial plant there are 1,063 terminal poles, and over 316,000 feet of aerial cable.

Automatic vs. Manual Systems—MILLER.—*Proceedings International Electrical Congress.*

It is wholly possible to make a machine effective to connect together any two lines of a system, whether it be large or small, and afterward to disconnect those lines. It is the author's conclusion that the result is now reached satisfactorily and that, in view of this, and the future progress which this must stimulate men to make, a higher success will yet be reached. Common battery and party line working are possible with automatic apparatus. The service as now given in various places is satisfactory to the public. The automatic system is not only a possibility, but is actually here. As to investment, the present costs of automatic equipment are greater than for manual equipment, particularly in the smaller offices. As the group gets larger, the difference is less marked. A most important disadvantage of automatic systems, as so far developed, is an increase in

the cost of trunk lines for connecting together the various offices in an exchange. This seems to have been overlooked by engineers, but should not be disregarded. The author comments that he has not solved the problem, but says that it was his object to state the problem clearly as he saw it, and hopes that this has resulted in a distinct service having been rendered.

Trolley Car Telephone.—Electricity, September 14.

Superintendent Boden, of the Pittsburg Railways Company, is reported to have invented a telephone which can be used for speech transmission over the overhead trolley wire of the street car system, presumably while that circuit is carrying current for power purposes. The device is described as being portable, hung in a neat box like a suit case, and can be used from any pole along the entire line. A jack on the pole may be connected with by a plug connected with the telephone set, and through headquarters connection may be made with the entire telephone world. From the description one would be inclined to believe that special telephone lines are strung along the right of way as, if the trolley wire is used, why dismount from the car to talk?

Strowger Automatic System—LUBBERGER.—*Telephony, September.*

The third article of a series, treating the bridging system, in which the line relays are bridged across the lines instead of being in series with them as in the previously described system. In the belief of the writer the automatic system is no less flexible in its ability to satisfy special demands than is the manual system. Instances of such flexibility are cited. The trunking capacity of the Chicago exchange is nineteen per cent. In the busiest sections in Grand Rapids, never more than nine or ten trunks are occupied. In Los Angeles, California, a four thousand line automatic office is in course of equipment. An automatic subscriber may call another automatic subscriber on this exchange by the usual method, or he may call a subscriber in the present main manual system, the intention being to operate the manual and the automatic offices in conjunction for some time. Automatic apparatus has been adapted to manual apparatus in Traverse City, Michigan, with the effect that the board already there has been given much of the advantage of the multiple board at a smaller expense. Six thousand subscribers in an exchange require current at the busiest hour at a rate of twenty amperes at fifty volts.

Telephoning on a Ray of Light—SMYTHE.—*Telephony, September.*

A popular discussion of the radiophone, including reference to the method involving lampblack, and to that using the selenium cell.

Telephones in Hospitals.—Electrical Magazine, London, May 26.

The King Edward Sanitorium for contagious diseases is fitted with light, portable telephones, so arranged that nurses can carry them to the beds of the patients, enabling conversations to be held between patients and their friends in any part of the island.

Telephone Storage Battery Explorer.—Electrical Magazine, London, May 26.

A brief description of an improvised arrangement of an incandescent lamp suitable to be placed in the solution of the storage battery to enable the plates to be examined, the current for the lamp being taken from the battery itself.

Automatic Telephones in the United States.—Electrical Magazine, London, May 26.

Automatic telephones having the Strowger system have been installed in eleven exchanges, totaling more than 31,000 line equipments, and are in process of installation in a number of others. The question whether the subscriber will remain satisfied to do his own operating rather than have it done for him by someone else, has not yet been decided to the satisfaction of all. The article contains a brief description of the method by which the switches in the central office connect the lines together.

Strowger Automatic System in Los Angeles—HIGGINS.—*Sound Waves, September.*

Drawings of the substation equipments of the automatic system as used in this exchange, together with seven rules for guidance of inspectors and instrument-setters in connection with the cut-over from manual to automatic service.

Telephone Exchange Work Shop—HIGGINS.—*Sound Waves, September.*

The Home Telephone Company in Los Angeles, California, has a repair shop which also manufactures equipment. The present article illustrates several forms of desks, and describes the Foster patrol system in use in Los Angeles, made by the work shop in question.

Hopkinsville, Kentucky, Telephone System.—Electrical Review, September 17.

A description of the 700-line equipment installed in that city.

An Early Telephone.—Telephone Magazine, September.

A description of the invention of Henry C. Strong, exhibited as a speaking telephone in 1877. A picture of the instrument is given.

Automatic System in Los Angeles—HIGGINS.—*Elec. Review, September 3.*

An illustrated description of the system in question, showing also the apparatus for intercommunication between the automatic district and the manual district already equipped.

Carbon Ground Detector—JOHNSON.—*Telephone Journal, September 3.*

Carbon arresters frequently become grounded, placing the lines in trouble. The author describes an arrangement of a bell which will ring whenever a call is sent upon a line which is so in trouble.

Telephone Equipment of the Minneapolis—TYLER.—*Telephone Journal, September 3.*

The Minneapolis, one of the vessels of the Great Northern Steamship Company, plying Pacific waters, is equipped completely with a telephone system, instruments being in every stateroom, and in every department of the vessel's activity. In exposed places the instruments are shut up in water tight cases. The system has 150 lines.

Chicago's Automatic System.—Western Tel. Journal, September.

An illustrated description of the system installed by the Illinois Tunnel Company.

Progressive Western Telephone Exchange—SPRAGUE.—*American Elec., September.*

An illustrated description of the new equipment of the Colorado Telephone Company at Boulder, Colorado.

The Poulsen Telegraphone—GRADENWITZ.—*Telephone Journal, August 27.*

The Poulsen telegraphone, one of the most beautiful applications of electricity and magnetism to acoustic matters, was invented about two years ago. It proved to be an invention of such distinct promise that most of us have been surprised that it has not come into general use, not only for recording telephone messages, but as superseding the powerful but displeasing phonograph. But in the latter application the telegraphone suffers by comparison, because the results so far are not loud. In its application to the telephone there seems to be no reason, except the extent of the demand, why it should not come into general use. Speech is recorded in this instrument by speaking into a transmitter which causes variations in the field strength of a small electromagnet, the core of which stands very near to a steel wire, or steel band, which is in motion. Variations of magnetism are thus produced in the steel. Reproduction of the sounds is accomplished by drawing the steel wire or band again before the poles of an electromagnet, which is connected with a telephone receiver. The record on the steel wire may be erased by drawing it in front of a more powerful magnet, which smooths out the whole record and leaves the wire susceptible of retaining further speech. The speed and material of the wire play a very important part. The record may be reproduced an immense number of times without any diminution in the intensity being noted; and if the wire be wound up on a reel, as is usual, magnetism will not be transferred from one turn of the wire to its neighbors. Various special applications have been made, an interesting one being that the steel wire or tape may be caused to read its message into a large number of circuits. In one application speech is impressed on

the wire, which then passes before a number of electro-magnets, sending its message over the circuit connected with each, and then passes before a series of demagnetizing coils, coming again, ready for a new portion of the record, before the original magnetizing coils. In this arrangement the purpose is to relay the speech from one circuit into many others, and if it proves to be satisfactory in one circuit it should be equally so in all. There is much hope that this method may result in the production of a satisfactory telephone relay.

The Telephone Relay—TROWBRIDGE.—*Electrical Review, September 10.*

The tendency of the times is in the direction of improved telephone lines for long distance work rather than the employment of more sensitive instruments on comparatively imperfect lines. Many engineers believe that a telephone relay cannot be introduced because it must be more sensitive than the telephone it proposes to relay. If the relay has any moving parts, their inertia would seem to be too great for the actions they must execute. A telephone relay which will work in a laboratory may fail in practice, because of the complexity it adds to the already complex system. Dr. Trowbridge has devised an instrument in which the diaphragm holds a very minute solenoid in a balanced magnetic field, and in which the diaphragm when moved by the action of this solenoid in turn actuates a transmitter. In the laboratory the relay actually improved transmission over artificial lines. In actual test between Boston and New York, the working of the relay proved inferior to that of the through connection of ordinary practice. An interesting feature of the action of the relay on an artificial line is that the high notes of speech are transmitted better by the relay than by the ordinary instruments. The attenuation which the voice waves suffer was less for the high notes than for the low ones. As it is the effect of a distributed capacity to attenuate the high notes more than the low ones, it would seem that if this observation of the action of the relay be correct, it might be used with advantage to offset the distortion which Pupin coils now attempt to neutralize. It is hoped that Dr. Trowbridge may succeed in going further with his invention.

Telegraphy and Telephony in Japan—OI.—*Proceedings International Electrical Congress.*

FINANCIAL AND ECONOMIC.

The first telephone was brought to Japan in 1877. It was placed in practical use immediately. In 1883 plans were made for starting exchanges. Work was begun in 1884. In 1889 it was decided to make the work a state monopoly. The Government immediately appointed engineers to visit various parts of the world and study the telephone business. American construction was adopted rather than English, and in a very great degree Japanese development has been similar to that in America. In many particulars, however, they do things better than we. Forty-six per cent of the poles, for example, are boucherized. This treatment is a common practice there, and causes the poles to have eighteen years' average life, while untreated poles decay in five or six years. Double-cup porcelain insulators are exclusively used. Copper wire forms by far the greater part of the open construction, while cables are extensively used in the air and underground, although not to so great an extent as in present practice in this country. In underground construction, the ducts were first formed of three-inch cast iron pipe, but after the visit of the author to this country in 1898, his favorable impression of the use of clay conduit caused him to recommend it, and it is now used exclusively for underground work. Telephone cables of the same type as are standard elsewhere, are used in Japan, but air pressure is maintained within them. All of these cables are imported. The practice of the government of training its engineers, not only at home but by visits abroad, has been supplemented by an extensive collection of printed information. Each issue of TELEPHONY is translated by order of the Mikado into Japanese, and circulated among the engineers of the government. From the beginning the people welcomed the telephone service, and have patronized it. At the end of 1903, the empire supported nearly 37,000 telephone stations, served by forty-six exchanges. The equipment has rarely been equal to the traffic. The lines between Tokyo and Osaka were opened in 1896, are 377 miles long, and duplex telephony is carried on constantly and with success, a thing which is little practiced in this country, although it is understood how to do it. As to the finances of the enterprise, the investment is a little under $6,300,000. The receipts in 1903 were $1,335,300. The expenditures were $615,300. We are not told whether the expenses include a charge for depreciation or an equivalent setting-off of money to a sinking fund, but may presume that this is so. However this may be, the net profit is over eleven per cent, which is a striking result under public ownership.

Telephone Investments and Securities—REYNOLDS.—*Sound Waves, September.*

This author quotes authorities as giving the number of Independent telephone exchanges in the United States at 9,000, embracing about three million instruments, and another million instruments as being employed apart from central office connection. The Bell Company is accredited with having in the United States 1,200,000 instruments. A number of modern telephone exchange systems are furnishing service at a cost to the company of less than one-quarter of a cent per message, while one company claims a cost of less than 2/10 of a cent per message. One exchange is claimed to have cost $100,000, and to have earned $62,000 the first year.

New Zealand Telephone Exchanges.—Western Electrician, September 3.

Twelve new exchanges were opened during the year 1903, and new subscribers were added, bringing up the total to 12,105, an increase of fourteen per cent for the year. There are eighty-one exchanges in all, twenty-seven being the principal, and fifty-four being sub-exchanges.

State Telephones in England.—London Engineering, August 26.

As a financial undertaking, the Government control of telegraphs and telephones in England is not one which could pay dividends, as there is an annual deficit of a considerable amount. So far as growth is concerned the conditions are favorable for it, but the cost of construction is going up. As the outlying districts are developed, particularly in the London area, the length of line is increasing.

Relations Between the Telegraph and Telephone—DUNBAR.—*Finance, September 17.*

A reproduction of an article written and published in 1895, analyzing in detail the financial relations which then existed between the Western Union Telegraph Company and the American Bell Telephone Company, with reference to the general public business of transmitting messages. The contract in question was about to expire at the time this article was written, and the author speculates as to what policy would be pursued by the telephone company after that expiration. It is an article of much interest even at this time, and the method of its treatment is masterful.

Sins of Independent Telephony.—Western Telephone Journal, September.

The name "Independent" is one suggestive of separation. It means freedom from something. This writer hopes the day will come when the present telephone movement need no longer be called Independent. With some justice, the author charges Independent telephony as disregarding the opinions of others and their rights and privileges, with failing to protect mutual interests, and to recognize beneficial service performed.

Telephone Extensions in Russia.—Western Electrician, August 27.

Two hundred and fifty thousand dollars has been set aside to meet the growing demand for telephone service in Russia. About one-half of this will be spent in connecting up new subscribers and the rest in extending trunk lines between cities.

Automatic vs. Manual Systems.

KEMPSTER B. MILLER

There are two general methods of giving telephone service to a community:

1. By what is commonly called the "Manual" system, because of the fact that the switchboards employed at the central office require manual operation.

2. By the so-called "Automatic" system, wherein the central office operator is dispensed with, switches being so arranged that they will, without the aid of human hands, perform the necessary act of connecting lines for conversation, and afterward disconnecting them at the will of the subscribers.

In the manual system in its highest development, the telephone user has only to place his receiver to his ear and make his wants known, the desired connection being made at the central office by operators. This system may be assumed to be highly developed, as it has been almost universally used since the advent of telephony, a period of nearly thirty years. The manual system, in its present form, represents the consecutive work of a large number of men in a field of the most intense and constantly increasing activity, all these men striving for the best possible means of accomplishing a desired result.

In the automatic system, the central office switches are governed in their movements by the actions of the subscribers or users who desire connections and subsequent disconnections. The subscriber does his own work, manipulating the apparatus before him in such way as to cause the switches at the central office to select, connect with, and afterward disconnect from, the line of the subscriber desired.

Unlike the manual system, the automatic cannot be assumed at the present time to have reached a relatively high development. While the automatic switchboard has been in the minds of inventors since the year 1879, it is not true that it has been put into considerable use until very recently. Instead, therefore, of its development being paramount in the minds of a large number of practical telephone workers, it has been fostered till lately by but few men, some of whom were unfamiliar broadly with the details of the telephone business. With a courage that must excite the admiration of all, a very few of these men have persisted, and as a result, the telephone engineer, the operator of telephone companies, and last but most important, the general public, are confronted with what I think is the greatest problem of the automatic v. the manual switchboard.

It is not the purpose of this paper to attempt to solve this problem. The unequal degree of development of the two systems makes impossible a final satisfactory solution at the present time. It is rather to state some of its phases as they appear to me, and to make comment on them wherever my study of the situation has led to more or less positive convictions that this paper is offered.

A fundamental question affecting the entire problem is this: Is it possible to make a machine serve to effect the electrical connection of any line, in a large or small group, with any other line in the group, for the purpose of telephonic communication, and afterward to affect a disconnection when required? There can be, even at the present early stage of development, but one answer to this question. It is. The automatic switchboard at Grand Rapids, Michigan, recently selected for me 100 different lines chosen at random from among approximately 5,000 lines centering in that office. Some of the subscribers called did not respond, which will occur in any system; and some of the lines were automatically reported busy, which is to be expected; but in no single case was the wrong line chosen, and in but one case was the disconnection improperly effected. The verdict of a large number of the subscribers interviewed by me in that city is practically unanimous to the effect that they uniformly secure their connections and disconnections promptly, accurately and satisfactorily.

I conclude, then, in view of present achievement, and of that future progress which this must stimulate men to make, that it is possible for the automatic switch to perform these functions satisfactorily.

If, then, the automatic switchboard may be made to accomplish the commonplace connection and disconnection of lines, which forms the great bulk of the work in a telephone exchange, is not the system so inflexible in its method of operation as to preclude the possibility of its performing the great multitude of special duties which, while not constituting the bulk of the work, are nevertheless of constant occurrence and of hardly less importance? I refer to such matters as toll connections, private branch exchange work, and to a number of subordinate but necessary classes of service.

A prominent telephone engineer has recently remarked to the effect that if some of the people enthusiastic on the subject of automatic switching in telephone exchanges were to visit the school for telephone operators maintained by the New York Telephone Company, they would be discouraged in their efforts, as no machine could ever be made to perform the many and varied functions that it was necessary to teach these young ladies before they became proficient telephone operators. This seems to be a statement that has very little to do with the real automatic problem. It should never be required that the machine shall do the same work that is demanded of the girl, nor do it in the same way. That is manifestly impossible, for no machine can ever be endowed with intelligence. (It may be that some will say that there are some telephone girls similarly affected.) Since the very reason for the existence of the automatic exchange is to do away largely with the operator, it follows logically that whatever intelligence is to be applied to the making of the ordinary connection between two lines, it shall be that with which the subscriber desiring to make the connection is endowed. Here is a fundamental difference between the two systems which must always lead to different modes of operation.

The real functions that the automatic switchboard should be required to do automatically are those relating to the ordinary routine work of connecting and disconnecting subscribers' lines under the control of the calling subscriber. When some act needing intelligence at the central office is required, then let an operator supplement the work of the machine. To condemn the automatic switch because it will not perform all of the special requirements without the aid of human intelligence is just as unfair as to condemn a linotype machine because it cannot digest one of Steinmetz' equations. My mind has gradually changed upon this point until the doubt now exists as to whether the automatic system, wisely supplemented by operators, is not even more flexible than the manual. It is the ease with which the personality of the operator may be introduced into the automatic system as a whole, and also

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the ease with which certain of the purely automatic functions may be varied by mere changes in the circuit, or in the mechanical relation of the parts, that makes this doubt exist.

Of course, there are many phases of traffic and service that are yet to be worked out for the automatic system, but apparently the longer one studies the automatic problem the more nearly he becomes convinced that the automatic system is sufficiently flexible, with the interjection of human intelligence when necessary, to make possible the solution of practically all of the problems of service.

So far as I am aware, selective-signal party line working has never been accomplished commercially with automatic systems. I believe that the reason for this is solely the fact that automatic telephony is yet new. I have recently seen a plan whereby any ordinary number of stations can be selectively operated on a party line with practically no other added complication either at the central office or at the subscribers' stations, than that which is added to the apparatus of an individual line manual system, to adapt it to the same class of party line work. While the automatic party line is not yet developed to the extent of actual commercial use, it is entirely feasible and will not be one of the controlling factors in the solution of the problem: automatic v. manual.

I have looked into the subject enough to believe that what is true of the party line problem is true of the common battery problem, and also of the measured service problem, whether the measuring of the service is accomplished by collecting coins or tokens at the subscribers' stations, or by operating counting devices either at the substations or at the central office. There is undoubtedly a vast amount of work yet necessary before these features are commercially incorporated in working apparatus in an entirely satisfactory manner. I merely say that my study has shown me that no insurmountable obstacles exist that would prevent the successful establishment of party line, common battery and measured service working.

These statements do not greatly help the man who is today casting about in making a choice between the automatic or the manual system for present use. It is not, however, with the present alone that we are concerned. We must plan and build for the future; and the remarks just made are given merely as bits of contributory evidence as to what developments may be expected.

Having seen that the thing is possible, that it seems from a technical standpoint to be able to do what is wanted, another question is: Do the subscribers like it?

The evidence all seems to point in one direction. They do. At Grand Rapids, Michigan, 95 per cent of a large number of subscribers interviewed by me liked it better than common battery manual service; four per cent did not care much one way or the other, and one per cent liked the manual system better. At Fall River, Massachusetts, where the system has been in use for a much longer period, the verdict was quite the same in effect. Evidence from other cities where automatic service is being tried seems to agree. It must be said in fairness, however, that at Grand Rapids, the mass of subscribers is leavened by the presence of a large number of stockholders in the local company. Again, there is in that city much civic pride in the system. Telephone people come from all parts of the country to inspect the plant. Still again, the delight of the subscribers may be similar to that of a child with a new toy, but this can hardly be true, because of the fact that the exchange at Grand Rapids has been in service for a period of nearly nine months, and is carrying a very large business load, so that if the people were not actually getting satisfaction, they would probably know it. The new toy idea is also apparently disproven by the condition at Fall River and New Bedford, where the service has been maintained for several years, and seems to be much liked.

The question also naturally arises: Is not the automatic switchboard and necessary subscribers' mechanism too complex to be maintained in proper working order without undue cost? It is perhaps too early to decide this question. There is not enough evidence one way or the other. Judging from the past, however, the tendency of industrial achievements seems to be toward automatic methods. As examples, take the arts of printing, of weaving, and the use of machine tools.

Summing up, therefore, the statements already made, the automatic system is not only a possibility, but is actually here. With the interjection of human intelligence to supplement it in performing certain functions, it seems to be as flexible as the manual. Party line, common battery, and measured service working, while not yet achieved commercially, so far as I am aware, seem to be well within the grasp of those who are doing the development work. The public seems to like it, and we do not know whether or not it is too complex.

It will be noted from the foregoing that the idea of having the central office apparatus perform *all* the phases of telephone service is apparently not tenable. Many of those who have advocated it in the past have abandoned it, and are introducing human aid in the performance of some of the functions. This being true, a certain number of operators are, and will be, needed in automatic exchanges. This tends to destroy in some degree the primary object of the automatic system—the doing away with operators. We have seen many papers bearing on each side of this question, to the effect that the salaries of the operators were or were not to be eliminated; that retiring-rooms, matrons, operators' luncheons, etc., were or were not to be done away with. These items of expense will probably exist to some degree in all large automatic exchanges. That they will be greatly reduced is without question, but whether or not they are reduced to such an extent as to offset other sources of expense introduced by the employment of automatic apparatus is a problem yet to be solved.

What are some of these sources of expense that tend to offset the reduction in operators' salaries and expenses coincident therewith? Taking the automatic system as a whole, we find upon investigation that it is considerably higher in first cost than the manual system, and assuming that interest and depreciation are at the same rate in each case, this shows to considerable disadvantage for the automatic system in the annual charges due to these items alone.

For an exchange of 5,000 lines served by one office, the cost of automatic equipment including telephones, may be taken at $35 for each individual line. In manually operated exchanges the corresponding cost is not far from $25 per line. The difference becomes greater, that is, more in favor of manual, for smaller offices, and smaller or less favorable to the manual in larger offices.

Whether or not the depreciation on automatic apparatus should be taken at a higher rate than that on the manual is a question that we have not at present sufficient data or information to determine. It is true that in the automatic switchboard the flexible cord nuisance found in all present forms of manual switchboard apparatus is largely eliminated. It is also true that the automatic apparatus is more complicated, and requires greater care in its maintenance; but whether, if both systems are maintained with reasonable care, the automatic will show a greater rate of depreciation than the manual, I am not at all certain. Much of the depreciation in manual telephone apparatus is due, not to the fact that the apparatus wears out, but rather to the fact that it is rendered obsolete by new inventions. That the same will be true in the case of automatic apparatus connot be doubted, but it is a good point to bear in mind that if telephonic development should point toward automatic apparatus to the exclusion of manual, and should prove the superiority of automatic, then the highest developed and newest manual apparatus will

depreciate greatly in value by that fact alone. It does not seem unreasonable, therefore, to place the rate of depreciation on both manual and automatic apparatus at about the same figure.

In point of maintenance the advantage must be conceded to the manual. This is certainly true at present with regard to both the central office and the subscriber's station apparatus. No good reason is apparent why it should not always be true. Automatic apparatus is especially at a disadvantage at the subscribers' stations and it is really at this point that the automatic system seems to involve a poor engineering feature. The tendency of telephone development in regard to sub-station apparatus has been until lately along what seemed to be unquestionably good engineering lines. The sub-station equipment has been gradually simplified, the battery has been removed, as has also the magneto generator, and the instrument has been reduced to the simplest fundamental parts.

Automatic telephony as at present developed for large work takes a step backward by reintroducing the local battery. That this is disadvantageous no one can deny, but on the other hand it must be pointed out that the disadvantage is by no means as great as it would have been several years ago because of the fact that dry batteries have recently come into almost universal use for this kind of work and are far superior, all things considered, to anything heretofore available.

The disadvantage of local batteries, while mitigated, is still present, and is real; but, taking the automatic system as we have reason to believe it will exist in the future with no local batteries, it will still possess, as far as we are able to see, a more or less complicated impulse transmitting device, by means of which the subscriber will be able to direct the movements of the switches at the central office. Complexity not only of mechanism, but of function, is thus introduced at the subscriber's instrument, and this seems to be an inherent disadvantage to all present schemes of automatic exchange working. This, of course, is another factor that must be weighed in considering the relative economies of the two proposed methods.

There is a point that I have not yet seen mentioned in print, which under certain cases seems to be of great importance. This is the matter of trunking between two or more automatic offices in such cities or communities as naturally demand, by the distribution of their subscribers, more than one office. It is true that the present automatic switchboard seems to be capable of properly handling this condition if the requisite number of trunk lines between the two offices are provided. At first thought it seems that the number of trunks required between offices for a given amount of traffic might be somewhat less in the case of the automatic than in the case of the manual system, on account of the immediate disconnection and release of the trunks, in the automatic, upon the hanging up of the receiver of the calling subscriber. Further consideration, however, will show that there is very little difference in the time the trunk is held busy in the two systems, the length of actual conversation being assumed to be the same in each case. The reason for this is that, while the automatic gains in this respect in the release, it loses something in the making of the connection, because in the case of the automatic the trunk is selected with the first movement of the dial by the subscriber, and the length of time that the trunk is held busy, therefore, must include the time during which the subscriber is setting up his own connection; whereas, in manual boards a trunk line begins to be busy at the time when the *B* operator picks up the incoming trunk and designates its number to the *A* operator.

So far there seems to be little difference between the systems in this respect.

The bearing on the trunking problems of the relative efficiencies of different sized groups of trunks between offices does not, however, seem to have been weighed by many in considering the question of automatic v. manual exchanges. When sufficient trunks are provided between offices to handle business on the so-called "no delay" basis, it is known that a large group of trunks will handle very much more business per trunk line than a small group. For instance, when there are only 10 trunks in a group between offices, it is a well-established fact that slightly less than 80 calls per trunk per day may be handled. If, however, the group is increased to 100 trunks, as many as 145 calls per trunk per day may be handled. This is an increase of considerably over 80 per cent in actual trunk efficiency. In the present automatic system, group the trunks as you may, it is inherently true that the efficiency of the trunks is reduced to that of a group of ten. I do not mean by this that it is not possible to place as many trunks as desired between any two offices, but that any subscriber has access to 10 trunks only in order to secure a connection to any other office. It is true that some other subscriber may have access to another 10, or to the same 10, but no one subscriber can reach more than 10. This seems to be a grave objection to the use of automatic systems as at present developed, in those communities where several offices must be employed and where traffic is such as to demand a large number of trunks between offices. The remedy to this is obviously that of giving the subscriber the chance to select his trunks from larger groups. This, I take it, is one of the problems that need serious consideration in adapting the automatic system to very large communities. It does not enter seriously in single office work.

In all that I have said I have attempted to take the very practical view of the engineer, and fundamentally that view must always compare systems with the intent of selecting a means of doing what is required well enough for the smallest price. From the strictly engineering view one does not take into account relative popularities of mere ways of accomplishing results. But this is necessary in such a case, for there are features of the automatic system which may make it so popular as to force upon the owners or prospective owners of telephone industries a serious consideration of the doctrine of expediency. This is by no means the least of the important things to consider.

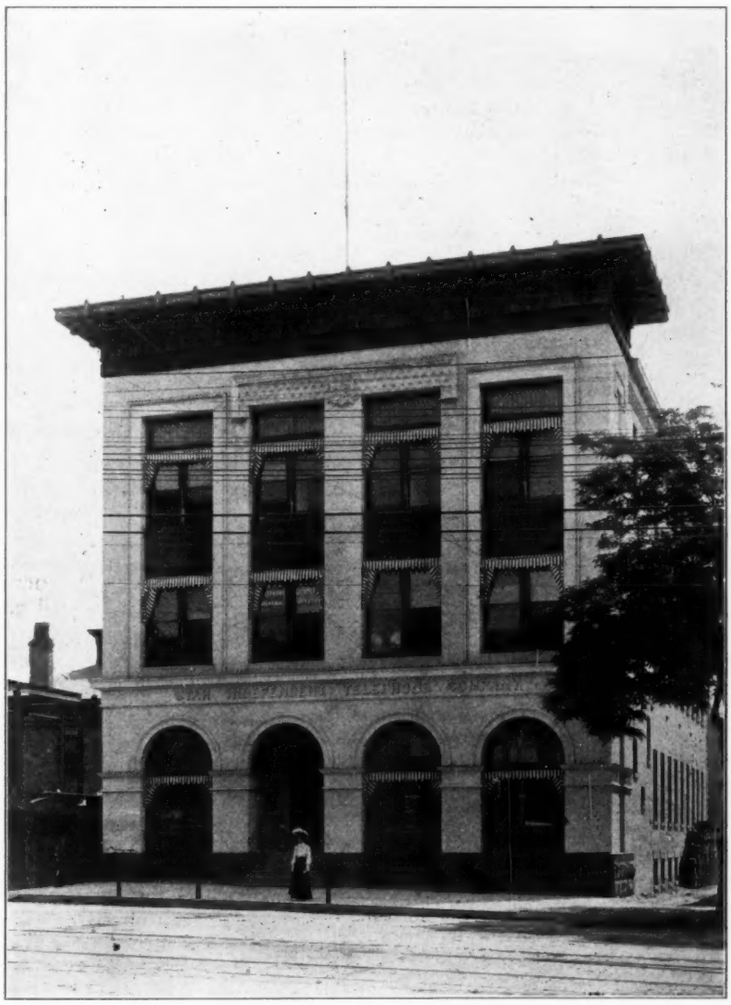
I expect to be criticized because I have not solved the problem. It cannot now be solved any more than the question of alternating v. direct-current transmission could be decided when we first were brought to realize that there was an alternating v. direct-current transmission problem. My object has been to state the problem as I see it, and I hope that in doing this, something may have been accomplished toward clarifying it.

THE SITUATION AT PEORIA.

The Inter-State Independent Telephone Company is going ahead with the laying of conduits and stringing of wires in Peoria and expects to have 1,200 telephones ready for service by November 1. The Citizens' Telephone Company will be connected about that time and Pekin patrons will then have communication with Peoria. Ten thousand telephones in the downtown district of Chicago are ready for connection with the Inter-State as soon as the line from Aurora to Chicago is finished. The Inter-State now has thirty-one exchanges in Illinois. Stockholders in the Citizens' Company of Peoria are also interested in the Inter-State and the expansion of the Independent company means much to the local Peoria line. *There will be no sell-outs.* The Independent telephone is a permanent institution and its patrons are daily growing in number. The new book of the Citizens' Telephone Company, which will be issued soon, contains 1,600 names, 1,000 of which are Pekin subscribers. Manager Glass is adding to the list daily and the limit seems a long way off.

Salt Lake City Exchange

SALT LAKE CITY, Utah, is justly proud of the magnificent new exchange of the Utah Independent Telephone Company, which was recently completed and installed in that busy western metropolis. The growth of the company from the first has been little short of marvelous. Although the exchange has been in operation less than three months it now has more than 3,000 subscribers, and the list is being largely added to every day. This is entirely due to the most excellent service being given by the Independent company, which is a distinct revelation to the people of Salt Lake City, and something which the old company never furnished the public, nor could it with its antiquated equipment, its utter disregard of the demands of its subscribers for better service and more generous treatment, and its out-of-date methods of transacting business and conducting a telephone exchange. Salt Lake City is happy in the knowledge that it has shaken itself free from the grasp of the Bell concern and is now numbered among the important cities of the country where a strictly modern Independent telephone plant is being successfully operated, and is acknowledged superior to its competitor in every way.



HOME OF THE UTAH INDEPENDENT TELEPHONE COMPANY.

Visitors have been loud in their praise of the substantial character of everything in connection with the plant. No expense has been spared to make it a model exchange, and its most sanguine supporters are already delighted with the results obtained. Marking as it does an era in telephone engineering, especially in the west, it will serve as an example for other companies.

"The service of the Rocky Mountain Bell Telephone Company," says the *Daily Reporter* of Salt Lake City, "has been worse, if possible, since the Independent company commenced, than it was before. A wait of one or two minutes before the operator answers is not unusual, and when a connection is made, it is likely to be with the wrong number as not. One reason for this is that all the best operators have gone over to the new company, attracted by higher wages and a chance to better general conditions. This, as much as anything else, will cause the old company to come into even greater disfavor with the public. A business concern that allows a rival company to do this for the sake of a few dollars is as good as lost. The Independent company could ask nothing better than a policy of this kind on the part of the Bell people."

The Utah Independent Telephone Company organized and was chartered as a corporation in April, 1903, having previously been granted a fifty-year franchise by Salt Lake City's aldermanic body in December, 1902. The capital stock of the company is $1,000,000. A bond issue of $1,500,000 was authorized, but none of the securities was ever placed on the market.

The officers of the company are as follows: President, Gov. Heber M. Wells; vice-president, S. F. Fenton; secretary, E. L. Sloan; treasurer, Hal W. Brown; managing director and counsel, Elmer B. Jones. Directors, Gov. Heber M. Wells, Elmer B. Jones, S. F. Fenton, M. H. Walker, E. L. Sloan, John Henry Smith, George T. Odell, N. W. Clayton, Hal W. Brown.

The contract for the construction of the plant was awarded on March 27, 1903, to the Stromberg-Carlson Telephone Manufacturing Company of Chicago. On August 20 of the same year this same company was awarded the contract for the switchboard and apparatus, and on March 11, 1904, was given the contract for the toll board and apparatus.

Active work commonced on the plant August 1, 1903. On June 30, 1904, the exchange was thrown open for public inspection. A two days' reception was held and in that time fully 5,000 people thronged the handsome new building, bestowing praise in a most lavish manner on the new Independent company, the telephone system as a whole and the superior workings of the exchange in particular, the service from the first being of a very high order. When the exchange started business it had 1,600 subscribers, and for weeks new subscribers came in at the rate of forty a day without any soliciting.

CONSTRUCTION.

Here are some interesting figures regarding the construction of the plant:

The underground cable work was commenced January 19, 1904, and completed June 1, 1904. Number of feet of cable installed, 122,812; number of splices made, 323; number of laterals pulled in, 60; buildings cabled, 17; terminals installed, 90; number of pairs of wires in cable, 6,200; total conductor feet in cables, 44,850,000 feet, or 8,524½ miles; sizes of cables, 50, 75, 100, 150 and 200 pairs No. 19 B. & S. D. W. paper, made by the Stromberg-Carlson Company. The average number of feet of cable drawn per working day was 7,118. This shows quite a departure from the old methods used in which from 2,000 to 3,000 feet was considered a good average day's work. The greatest number of feet of cable drawn in one day was 14,919 feet. The cable was of 200 pairs and was drawn in in eight hours with nine men, the average section length being 403 feet. The average time per section was six minutes; the fastest time four minutes, forty-nine seconds. The best previous record was made in 1898—7,556 feet in 8½ hours with a foreman and nine men.

The subway construction was commenced August 10, 1903, and completed February 1, 1904, 25,582 lineal feet of subway being built, in which 256,963 feet of vitrified single duct tile was laid. The number of manholes is 73; number of laterals, 60; number of terminals, 43; number of men employed on work, 260. This work was done under the personal supervision of those in charge and is laid in all the streets indicated in the franchise. Some difficulties were encountered which severely tried the patience and resources of the entire force. As is well known to many, Salt Lake City lies in a sort of basin, presumed to be at one time the bed of a great inland sea, the echo of which is still present in the Great Salt Lake, consequently delving into the earth reveals many strange phenomena. In some places excavations as deep as twelve feet revealed alkali dust, while quicksand was a common enemy. Subterranean streams of whose existence no one was aware were frequently encountered. The city is surrounded by the towering snow-capped mountains of the Wasatch and Oquirrah ranges, and the flow of water is continuous through Salt Lake Valley. Every method known to engineering was used in prosecuting the work. Where pavements were encountered, lying as they do on a foundation of concrete, a steam-drill operated from a portable boiler, was used to loosen the concrete. This enabled a larger amount of concrete to be removed in a day's work than was possible with pick and bar. Other up-to-date methods were utilized to hasten the work.

The aerial cable—"open wireless"—work was begun December 20, 1903, and completed May 15, 1904. During that time 4,325 poles were set, ranging from 35 to 85 feet, Idaho and Oregon selected cedar poles being used exclusively. Salt Lake City streets being laid out at exact right angles to each other it was possible to devise a symmetrical system. The great Mormon temple being the geographical center of the city, the telephone center is somewhat of the same character, accordingly the lines of subway and the pole lines were somewhat easy to design as compared with cities where the streets are not laid out in squares. State street or First East (meaning the first street east of Main street or East Temple street) is one of a series of dividing streets running north and south. It extends south about four miles to the city line. This made a natural highway north and south from the exchange building.

In all streets running east and west and some north and south in the center of the city, subway is constructed. On other streets running north and south from the east and west streets, and on all those running east and west from the north and south streets, poles are erected. On the west side streets, on the west side of the street; on the east side streets, on the east side of the street. The poles are located about 100 feet apart, just outside the line of the trees. The number of terminal poles established was 1,063; number of feet of aerial cable strung, 316,363; number of feet of messenger wire strung, 340,200—size and kind, 7-16 S. M. steel; number of pairs of wires of aerial cable, 25-100; number of feet of conductor, 38,155,450, or 7,226½ miles; number of tops splices, 1,594; number of pole tops connected, 1,063; number of miles of twisted pair rubber-covered wire strung to subscribers, 53—kind, Hall pole top; number of miles of single conductor in cables, 15,750¾, or three-fourths of the way around the world; number of men employed on line work 12, on cable work 17, on installing 12; average number of feet strung per working day, 4,400.

An elaborate system of toll lines and exchanges has been outlined by this company for Utah and considerable work has already been done along this line. At Ogden, an exchange is being constructed, which is an exact duplicate of the Salt Lake City exchange, except in size, being built but for 3,600 line capacity. It was opened in August. A substantially built toll line of a capacity of 40 No. 10 copper lines is already built between Salt Lake City and Ogden with 10 pairs of wires strung the entire distance. At Murray, seven miles from Salt Lake City, a full central energy lamp line signal exchange has been installed. A first-class copper construction toll line is already built past Murray and several miles south of that point. Franchises have been secured at Bountiful, Kaysville, Farmington, Provo, and in all the principal cities and towns of Utah, and work is proceeding as rapidly as possible. Sixteen exchanges will be built in Utah in the next few months, together with toll lines connecting them together.

The number of poles set was 1,600; number of miles of No. 10 copper wire strung, 356; number of miles of No. 12 copper wire strung, 48; number of insulators and pins used, 16,000; number of crossarms, 1,980; number of men employed, 40. Work was commenced November 1, 1903. It is still going on.

EXCHANGE BUILDING.

The architect of the new exchange building was Fred A. Hale. The plans of the building were approved June 15, 1903, contracts were awarded June 26, and work was commenced on the structure July 1. The building was completed and turned over to the company January 1, 1904, and was occupied on May 1. The size of the lot on which it stands is 74x130 feet, while the building itself is 50x118 feet in size. It is constructed of approved fireproof expanded metal partitions, steel window frames and casings, fireproof glass, maple flooring laid on concrete.

The handsomely designed entrance is brilliantly lighted by an antique lantern of wrought iron surrounded by a curiously wrought grille of the same material. Entering the building through the massive plate-glass doors the visitor finds himself in the vestibule, which is brilliantly lighted by several handsome wrought iron combination gas and electric light fixtures. The vestibule has a broad marble panel around its entire length, and makes a fitting border to the mosaic flooring, which is of a very handsome design. The woodwork throughout the entire building is selected birch, hand polished and a beautiful specimen of the cabinet-maker's art.

The first office to the left is the contract or city department, which is tastefully furnished in mahogany. A handsome bank railing and cashier's desk divides the room and affords callers a ready means of securing information regarding the various departments or of liquidating their accounts. In this office is located the contracting department, as well as the directory department, also furnished in mahogany.

Across the vestibule is the public toll room. This room is used as a reception room for visitors who desire to call at the exchange for any purpose. Installed in one end of the room are two handsome booths, in which are located public station telephones for the use of callers desiring to talk out of town or in the city where a booth is preferable. Easy

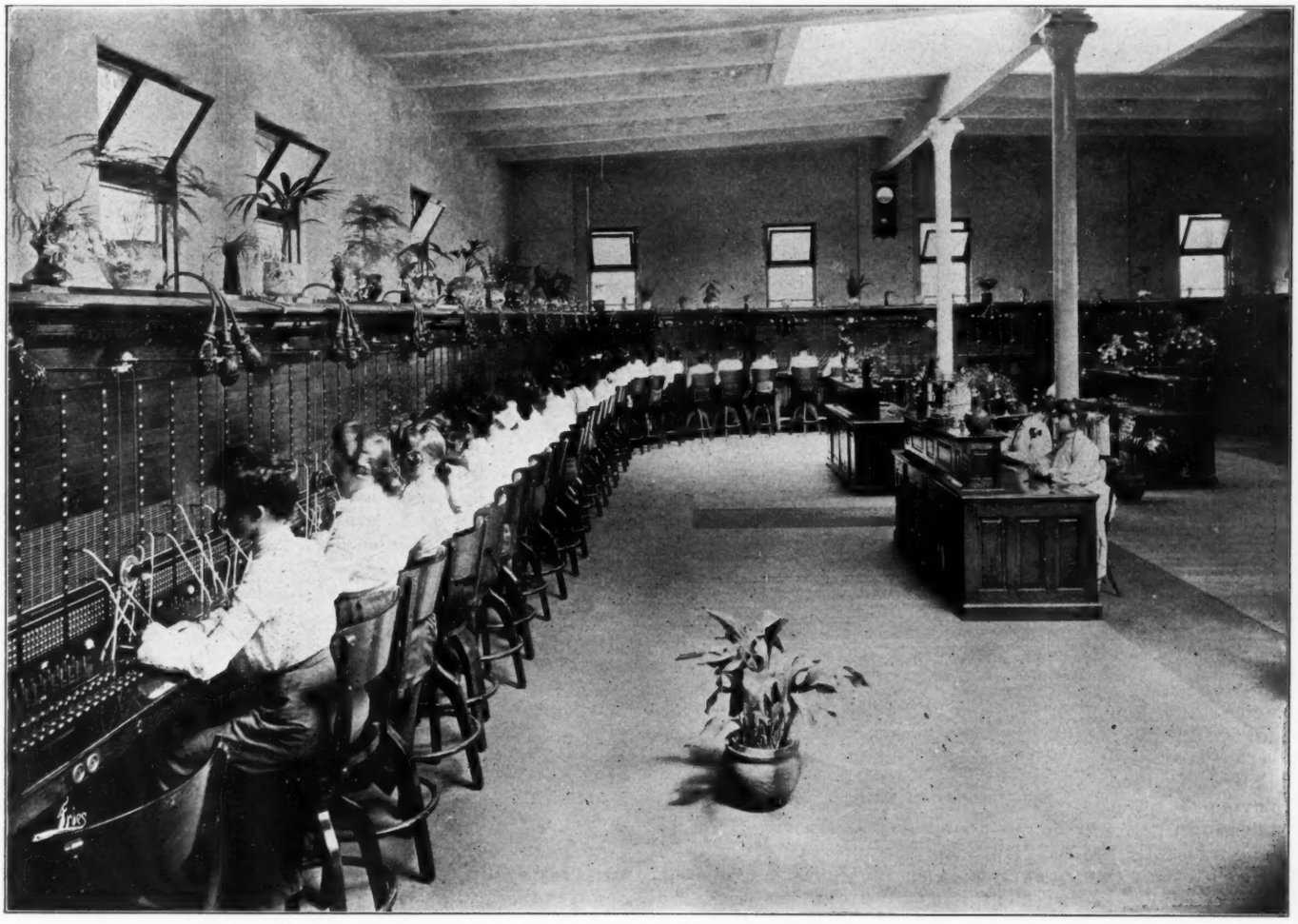
chairs, reading matter and a general air of comfort make the moments pass quickly while waiting for your party.

Between this room and the next room to the west, known as the toll room, three plate-glass swing windows have been inserted, giving visitors an opportunity of observing the operation of the toll board, and permitting them to give their instructions regarding out of town calls directly to the recording operator at the toll board—a unique arrangement. The toll room is located in the southeast corner of the building and contains a four-position relay bridged multiple toll board, which is constructed of highly polished golden oak, and has an ultimate capacity of 100 toll lines and forty trunks to the main switchboard on the third floor. Each position is fully equipped with cords and plugs, double supervisory signals, double ringing and listening keys, etc., calculagraphs for the proper indicating of the duration of the conversation, together with various apparatus for the proper handling of the toll business of a large and growing exchange.

The visitor is next conducted into the engineering department, which also includes the offices of the superintendent of construction and that of the superintendent of equipment and maintenance. Here are kept the records of the various lines and instruments and from here are issued the orders for all the work done by the employes of the various departments, including the trouble which has been tested out by the wire chief and turned over to the maintenance department for attention.

Extensive and well appointed toilets are provided for the employes, all built of marble and having mosaic flooring.

The large stockroom contains the various instruments and supplies, and is filled with the many different articles necessary for the equipment of a successful exchange. Underneath this room is a large store room, which is reached by a short flight of iron steps, and a large freight elevator, capable of handling many tons of freight. Here is stored cable and other heavy stock. Two sides of the room are occupied by a large number of commodious lockers for the installers and other employes. Adjacent to this room and opening into it is the boiler room, in which is installed a twenty-five horse power boiler for heating the building. An auxiliary heater to be used during the summer is also located here. Space is provided for several tons of coal, a dust-proof air-tight brick room being provided for this purpose.



VIEW OF MAIN SWITCHBOARD, UTAH INDEPENDENT TELEPHONE CO

A basement the full size of the building, which is finely lighted and cemented throughout, affords ample storage for the future.

Returning to the first floor, the wire chief's room is next visited. Here is located the terminal, relay and intermediate racks, generator powerboard, etc. The lines entering the building through the underground cables terminate in groups of terminals corresponding to the number of that particular cable. From this point the circuit pursues its devious course through the various apparatus which is a part of it, including an elaborate system of protection from lightning and electric light or power circuits. The various racks occupy the entire west end of the room, which is 45x90 feet. Ample space is provided for the extension of the rack to its ultimate equipment of 12,600 lines. Situated at the

east end of the room is the wire chief's desk, which is a handsome two-position desk of the same character as the other desks in use in the exchange, and contains a full equipment of main and desk trunks, test lines, test plugs, cable test lines, test and howler cords, order wire circuits, volt and ampere meters, special generator circuits, and testing instruments of various kinds, all provided for the purpose of rapidly testing and locating trouble.

Standing exactly in the center of the room at the east end of a magnificent white Italian marble base or foundation twelve feet square are the powerful generators. These constitute two complete duplicate charging outfits, each set consisting of a twenty horse power General Electric Company's type "I," eight-pole, sixty-cycle, three-phase, 220-volt alternating current motor, direct connected to a Holtzer-Cabot type "H" multipolar generator, delivering an output of twelve k. w., furnishing 200 amperes at sixty volts. Each motor generator has sufficient capacity to operate the full ultimate capacity of the storage batteries at the normal charging rate. For the purpose of ringing the subscribers' bells there is provided one Roth Brothers' type "1" B. R. self-exciting ringing dynamotor belt connected to a General Electric Company's one horse power, 220-volt, three-phase, full-load, automatic start, alternating current motor, furnishing both alternating and direct currents and equipped with howler, busy-back, intermittent ringing, etc., also one twelve T. R. ringing dynamotor to operate one 40-volt battery for emergency. Facing north and directly at the side of the generators stands the power board, which is a vast aggregation of switches, instruments, etc., bewildering to the eye. It is constructed of white Italian marble, mounted in iron supporting frames. It consist of four panels and is equipped with full load, automatic over and underload starting boxes, starting compensators, starting switches and fuses, charge and discharge ammeters, voltmeters and switches, rheostats, overload and underload circuit breakers, battery fuses, ringer lamps, bus-bars of various kinds, operators' position switches, etc., forming a most complete collection of electrical apparatus that is well worth a visit by both expert and layman.

Leaving the wire chief's room one descends to the storage battery, which is located in the basement. The room is provided with adequate facilities for carrying off the gases generated by the battery, a special brick flue being provided for the purpose. The battery is arranged in two sets, each set consisting of twenty cells of type G-23 Electric Storage Battery Company's accumulators in lead-lined tanks, and having an ultimate capacity sufficient to operate the 12,600 lines for a period of twenty-four hours without re-charging. The duplicating of the plant insures continuous service and is well worthy of emulation by other telephone companies.

Located in the basement and directly under the wire chief's room is the cable terminal room. The cables entering from the street are held on tastefully designed iron racks, supported on steel posts extending the entire length of the room and running from floor to ceiling. Sixty ducts entering the room permit of 24,000 lines being accommodated. The cables are separated from each other the same distance through their entire length just before being turned up to enter their respective openings in the floor of the wire chief's room. A wool cable is spliced to the underground cable which continues on to its respective group. The entire arrangement of the cables is a most artistic, as well as practical, one and reflects great credit on the designers.

Located in the basement directly where the lightning and power wires enter from a special conduit is a white Italian marble protection panel, equipped with everything necessary in the line of switches, fuses, lightning arresters, etc. The various meters showing the consumption of current are all of the glass-faced type and are a very handsome aggregation of instruments.

Returning to the first floor, the visitor is conducted up a flight of iron steps to the second floor, where are located the offices of the company, occupying the front of the building. They are exceedingly handsome and are furnished with that quiet elegance and substantial appearance that betokens the character of the institution. Solid mahogany furniture is provided for the directors' room, managing director's office, local manager's office and general offices, while handsome rugs allow one's feet to sink deep within their folds. The offices are brilliantly lighted, as is the entire building.

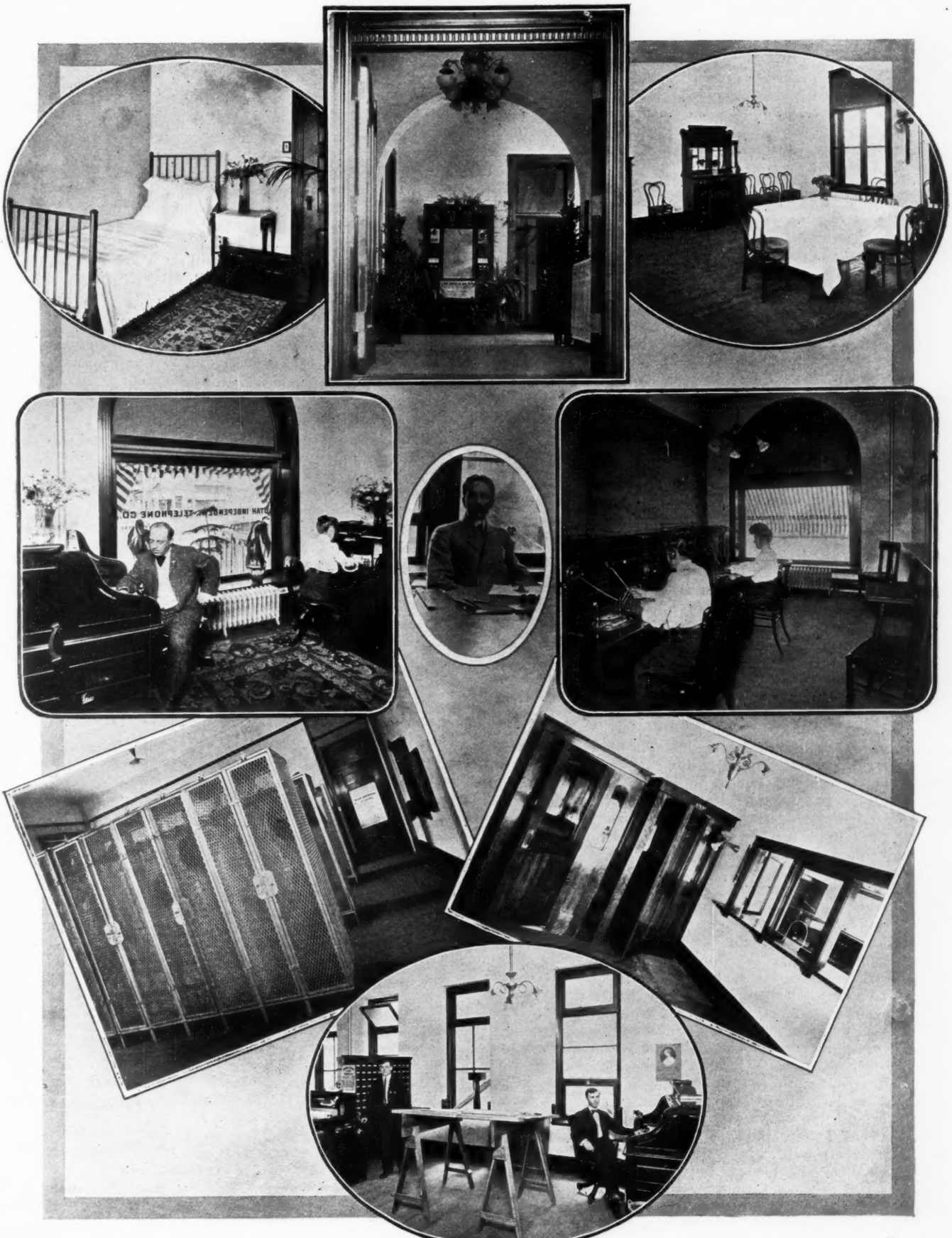
Passing along, the auditing and collection departments are reached. These are large, well-lighted offices located on the north side of the building and are handsomely furnished in golden oak. Next to these is located the legal department, its walls concealed by solid rows of ponderous legal volumes.

The visitor returns to the front of the building and is conducted to the locker room. This is a large room located on the south side of the building, and is given up exclusively to the use of the operating department. Eighty-five expanded steel lockers are at present installed, provision being made for an ultimate equipment of 150 lockers. Opening off of the locker room are large, commodious, brilliantly lighted dressing and toilet rooms, a handsome dressing table and an abundance of full-length mirrors, providing adequate and satisfactory means for the operators to make their toilets without fear of crowding each other. Opening from the locker room is the dining room, a spacious, pleasantly lighted room capable of accommodating a large part of the operating force. A handsome extension table, capable of seating thirty people graces the center of the room. A magnificent sideboard of natural walnut adds to the attractiveness of the room. Connected to this room is the kitchen and pantry. A large refrigerator insures the preserving of perishable food. The kitchen is equipped with gas range, hot and cold water faucets, sink, and everything necessary for the purpose, while a specially constructed flue carries off all odors of cooking. The culinary department is presided over by a competent chef, thus insuring appetizing and wholesome meals, which are served to such operators as may desire them at actual cost. Evidently the company intends its operators to be well fed.

The locker room also contains a recording time register. Each operator in passing out to her work removes her time card from the "out" rack, drops it into the clock, presses the handle and the exact time when she went on duty is recorded. When she leaves her work the reverse action takes place, thus insuring her of an exact record of the number of hours worked and preventing any possibility of errors arising. Sundays and other overtime is registered in the same manner.

Ascending another flight of iron steps the visitor is greeted with the word "Rest," and entering the room is forced to acknowledge that the word is no misnomer. An atmosphere of rest permeates everything in it. The room is handsomely furnished with willow and rattan furniture, settees, sofas and easy chairs abounding on every side. The floor is covered with green matting, which makes the room look cool and attractive. A handsome desk, equipped with stationery, graces the corner of the room, making it convenient for the operators who wish to attend to their correspondence while resting. A bookcase filled with books and periodicals supplies reading matter, while a telephone for their use enables them to talk to their friends. It is certainly a pleasure to rest under such conditions.

The next room to engage the visitor's attention is the hospital. This brings up visions of pale faces, white-capped nurses and dread instruments of surgery, but nothing of the sort is suggested here. A beautiful brass bed graces one corner and its snowy counterpane, linen and elegantly embroidered pillow shams makes it fit for some dainty lady's boudoir. Solid mahogany tables and chairs are provided for



VIEWS OF EXECUTIVE AND OPERATING DEPARTMENTS OF UTAH INDEPENDENT TELEPHONE COMPANY.

Hospital. Vestibule. Dining Room.
Contract Department. Managing Director. Toll Room, showing Toll Board.
Locker Room. Equipment and Maintenance Departments. Public Toll Reception Room.

use and comfort, while a medicine chest containing a few emergency remedies is on the wall. A handsome chandelier completes a pretty picture, and one would almost be willing to be ill amid such congenial surroundings.

Opening off the hospital is a beautiful little bath room, equipped with all the conveniences that a refined taste could demand. A beautiful white enamel bath tub looks inviting. The room is finished in white marble and white tiling and a mosaic floor of an artistic pattern looks cool and inviting and permits of absolute cleanliness.

OPERATING ROOM AND SWITCHBOARD.

The magnificent and immense switchboard is located in the operating room, which is on the third or top floor of the building. The operating room itself is 48x98 feet, and is strictly fire-proof, there being no woodwork exposed except the flooring, which is of polished hard wood laid upon a fire-proof foundation of six inches of concrete, supported by iron beams.

The visitor is at once impressed with the abundance of light and air, as, owing to the fact that the building stands isolated on all sides, it was possible to have as many windows as were desired. There are twelve in number around the three sides of the operating room, and, as with the other windows in the building, are of fire-proofed glass, encased in steel frames and casings. Two ventilating skylights twenty feet square add greatly to the ventilating scheme of the room.and serve to make the room very light and attractive. The ceilings are twenty-five feet high and are supported by three steel columns around which are grouped the radiators, the entire building being heated by the hot water system.

The first object that greets the eye of the visitor is the switchboard, which occupies the space for about three-quarters of the way around the room, and is known as a full lamp signal, central-energy d. l. supervisory multiple board. It is an exceedingly handsome piece of furniture, being constructed of highly polished golden oak with all the beautiful colorings and shades possible to obtain, and equipped as it is with the various apparatus that forms the whole, it is dazzling to the eye of the layman. The switchboard has an ultimate capacity of 12,600 individual lines, or 105 positions, but at present consists of fifteen section of three positions each, or 45 positions. Each position has attached to it the equipment for 120 subscribers' individual lines, or a total of 5,400 lines ready for immediate use, and which can be added to without disturbing the present equipment. The first or annex position is used at present as a trunking position through which connections are made between the trunk lines from the toll board, located on the first floor, to the local subscribers' lines directly into the multiples containing the local lines. A multiplicity of cords, plugs, lamps, keys, etc., makes this appear to the visitor as a position to be avoided, but the ordinary telephone operator finds no difficulty in handling the position.

As already described, each section contains three fully equipped operators' positions, and the entire equipment of multiples, or to speak more correctly, the multiple jacks. In order that the reader will understand it fully let him imagine each line running through the entire board has attached to it, at each position, a branch pair of wires which are connected to the line and terminate in the springs of a jack and forming one jack of a group of hundreds. Each 100 (from 0 to 99) lines compose a group and are numbered and designated by large white figures on a black stile strip placed at the left of the group. The arrangement of the grouping is such that each operator has but to reach a short distance in front of her to make connections with every line and has access to every line in the exchange, thus making her own connections without any loss of time, as was formerly lost in trunking the connections, and is directly responsible for all errors in making connections, whereas under the old trunking or transfer system two and sometimes three operators participated in the work of getting two subscribers connected, a decided improvement.

Terminating on each operator's position are 120 subscribers' individual lines ending in 120 small incandescent signal lamps, together with 120 answering jacks, each lamp and jack numbered with the subscribers' telephone number and placed immediately in front of the operator, with the jacks directly under the lamp, making it possible to answer calls even though the operating room is dark. Each operator has for her individual use fifteen pairs of cords and plugs with their accompanying ringing and listening keys, double lamps, supervisory signals, order wire keys, etc. Suspended in front of her so that she can speak directly into it is a long distance switchboard transmitter, which can be raised or lowered according to the height of the operator. The operators' receivers, of which each operator has her own during the time she is an employe of the company, weighs only two ounces and is worn while she is at the board. A green silk conducting cord attached to a plug is connected with it, and a jack inserted in the face of the keyboard provides a convenient arrangement for rapidly connecting and disconnecting the receiver from the board if the operator wishes to leave that position.

The board is beautifully lighted with incandescent lamps attached to tasteful three-way lamp brackets, to which are attached dark green half shades, thus preventing the light from shining in the operators' eyes. The outside lamps of each bracket are connected to different lighting circuits and the center lights are supplied by a special pair of feeders connected with the forty-volt storage battery located in the basement, in the event that the lighting circuits should be extinguished.

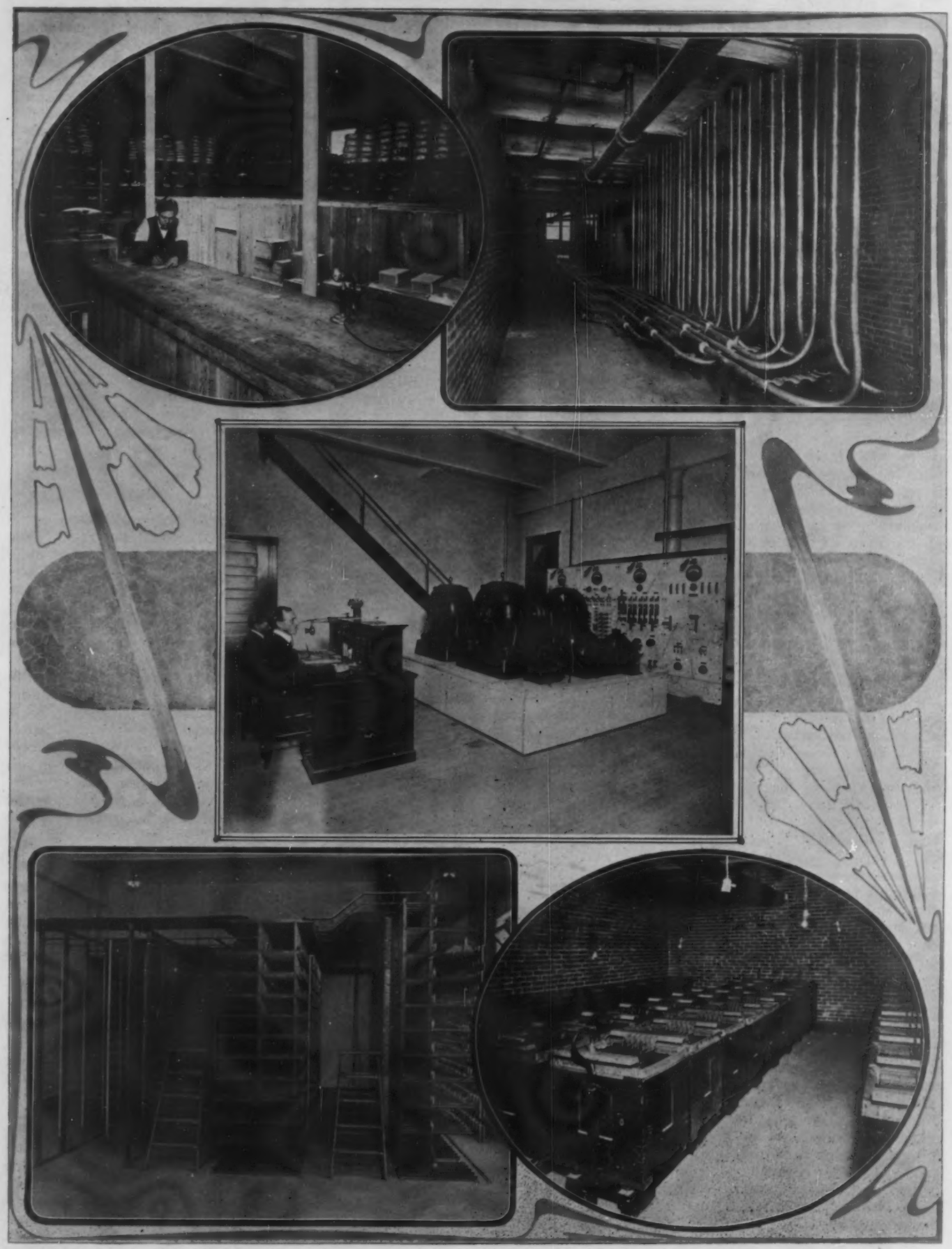
In addition to the above, the room is brilliantly lighted by six clusters of 6-16 c. p. lamps, each in the ceiling, enclosed in handsome opalescent bull's-eyes, and around the walls are located at frequent intervals a large number of combination gas and electric light brackets adding greatly to the appearance of the room and providing a means for continuous lighting, a very necessary feature for the welfare of the exchange.

Handsome and comfortable revolving chairs are provided for the operator's use, and a polished brass foot-rail allows her to repose her feet while at work.

The company desired to preserve its individuality in the matter of the telephones used, and to that end the Stromberg-Carlson Company designed a special type of black Flemish oak instruments which are models of up-to-date telephone apparatus, both in appearance and operation. The several well-known and highly-commendable features characteristic of the Stromberg-Carlson apparatus have been retained, especially the circuits and the new transmitter and receiver, with the result that the transmission and operation has already excited the wonder and admiration of all users of the apparatus.

FIRE ALARM APPARATUS.

Located in each section of the switchboard is a push button connected to a special fire alarm circuit, which is attached to an elaborate apparatus at fire headquarters. When the subscriber wishes to summon the fire department "Central" is called and informed. The operator pushes the button which releases the horses, at the same time striking the gong. She inserts a plug in line No. 19, which action calls fire headquarters. The location is announced and the alarm is given. A six-inch Gamewell fire alarm gong is located on the second floor. This is connected to the regular fire alarm circuits so that alarms are received at the exchange the same as at the fire department. Subscribers can learn of the location of fires within a few seconds after the box is pulled.



INTERIOR VIEWS SHOWING PERMANENCY OF UTAH INDEPENDENT TELEPHONE COMPANY'S PLANT.

Stock Room.
Relay, Intermediate and Terminal Racks.

Wire Chief's Desk.

Cable Vault.
Storage Batteries.

DESCRIPTION OF THE SYSTEM.

Each subscriber's line or circuit consists of a pair of wires which are continuous from the switchboard to the subscriber's instrument through the underground cable, aerial cable and insulated wire. When the subscriber desires to talk to another subscriber he removes the receiver from the hook. This action causes the battery current to flow out over the line and at the same time operate a line relay, which in turn, through the closing of the local circuit of the relay, causes a tiny incandescent lamp mounted in the switchboard to be lighted. This lamp is mounted immediately in front of the operator and is concealed from view by a disc or cap upon which the subscriber's number is located. The light shining through indicates to the operator that the subscriber is calling. This is supplemented by a larger light known as a pilot light, which is lighted every time any subscriber on that position is calling. The operator sits facing the switchboard, her whole attention riveted on the work before her, and immediately the light appears she takes up the first unoccupied rear or answering cord of a pair (each position of which is equipped with fifteen pairs) inserts the plug in the answering jack, which is located immediately under the lamp, throws the lever of the ringing and listening key corresponding to that pair of cords to the listening position, which action places her in direct connection with the subscriber, who is waiting for her. She says, "Number please?" and the subscriber gives the number desired, which is repeated in a reverse manner by the operator for the purpose of guarding against mistakes. When the number has been given and understood by the operator, she takes up the front or calling cord of the same pair, touches the tip of the plug to the thimble or heel of the multiple jack of the line desired, which is within her reach and readily found, and if not already in use, finds it clear and inserts the plug, at the same time drawing the lever of the ringing and listening key toward her to the ringing position. This causes the alternating, or ringing current, which is generated by the ringing generator, to be thrown out upon the line of the subscriber called for, ringing his bell. A green pilot lamp lights at the same instant in the face of the switchboard, indicating to her the fact that the line is all right and giving her visible indications of how many times she rings. When the lever is released a tiny red lamp, one of two, concealed in the key shelf, immediately in front of the key and corresponding to the front cord, is lighted and remains lighted until the subscriber answers. It may be necessary for her to ring several times, but when the subscriber answers the light is extinguished and the connection is completed.

When the conversation is finished each subscriber replaces his receiver on the hook, the relays connected to the front and rear cords are operated, thereby causing the two red lamps and a red pilot lamp to burn, indicating to the operator that the conversation is finished. She immediately withdraws the plugs and everything is restored to its former condition.

If when the subscriber had announced the number, the operator had found that line "busy," which fact is indicated to her by a slight click in her receiver, she would have told the calling subscriber, "That line is busy. Shall I call you?" If she receives an affirmative answer she will record the subscriber's number and the number called for on a pad placed at her right and every few seconds test the line by touching her plug to the jack in the same manner previously described. When the line is clear, she inserts her plug for the purpose of holding it, calls the subscriber and says, "You can have number so-and-so now." If the subscriber still desires it, she will connect him; if he does not, there is no complaint. She checks the "busy" call and the incident is closed.

If when the number called for could not be raised, and after the operator has made repeated attempts all to no effect, she will inform the calling subscriber that "Party doesn't answer." If the subscriber requests it, she will no doubt call him again. When she has exhausted every effort and the party does not answer, she will so inform the subscriber, and after taking down the plugs report to the chief operator that "Number 166 called Number 1,327," which record is kept on a "No answer record" sheet and is made in the column corresponding to the position upon which the called number is located. It may be possible that the called subscriber was prevented from answering the telephone when it rang. As soon as the latter can come to the telephone he calls up and asks the operator, "Who called me?" She can't give the information, but she connects the called subscriber with the chief operator and he asks her, giving her his number. She looks in the columns containing the number, of which 1327 is a part, and if the subscriber asking the question has been called she will tell him who called him. If he then desires the connection the operator will be instructed to give it to him.

If after a subscriber has called for a number and he desires to attract the attention of the operator (who only stays in on the connection long enough to get the number, and must never come in on the connection unless called in by the subscriber) he may do so by moving the hook up and down a few times, which flashes the red lamp connected to his cord. She will then cut in and say, "What is it, please?" and take his orders.

CHIEF OPERATOR'S AND OTHER DESKS.

Located immediately inside of the operating room doors and in a line with the center of the room stands the desk of that important and sometimes berated-by-the-public individual known as the chief operator; that ever watchful, patient and stern guardian of the operating department, whose duties consist in keeping an ever watchful and penetrating eye over the forty odd operators that at present comprise the force; who sees that every employe of that department does her very best, talks to hundreds of subscribers each day, listens to theirs and other people's troubles, is constantly in demand by someone, and must be patient, kindly and serene with it all. The position of chief operator, let it be known, is no sinecure. Her desk is an exceedingly handsome piece of furniture, consisting of a two-position equipment, which embraces a varied assortment of different colored signal lamps, keys and indicating devices, allowing her to observe the work of each operator without leaving the desk. A number of lines to the various positions on the switchboard permit the connecting of several subscribers at once to her desk. Access can be had from the desk to an inter-communicating system connecting the various departments in the building, and direct lines between the various desks permits a rapid means of communication between herself and her assistants. Provision is made within the desk for a card index system, upon which is recorded the names of subscribers and other information necessary for the rapid and satisfactory handling of a large exchange.

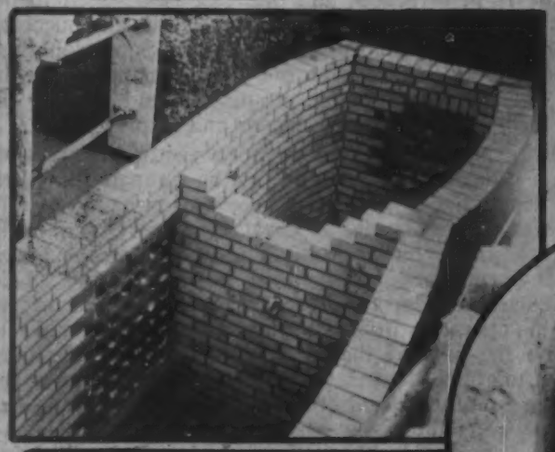
INFORMATION AND TROUBLE DESK.

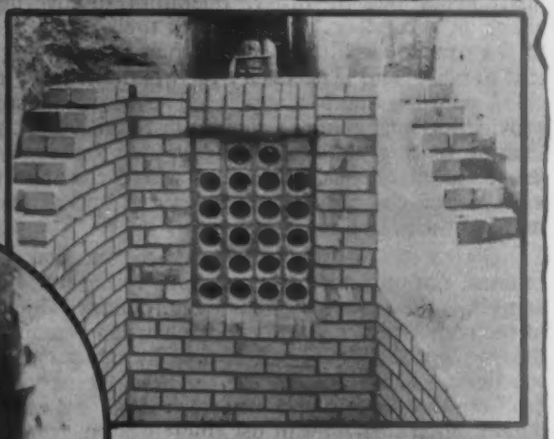
Next in line and immediately in front of the switchboard running east, is located the information and trouble desk, consisting of a two-position desk constructed of the same material and finished the same (as are all the desks) as the main switchboard, and forming two distinct desks or departments. The first position is known as the information bureau, and is for the purpose of providing for the use of the subscribers and the public means whereby any reasonable information may be secured. It is provided with everything possible in the line of apparatus to enable the information clerk to secure and disseminate all kinds of information, such as the correct time of day, time of trains and trolleys, excursions, picnics, theaters, accidents, fires, baseball games, important events and general information which subscribers

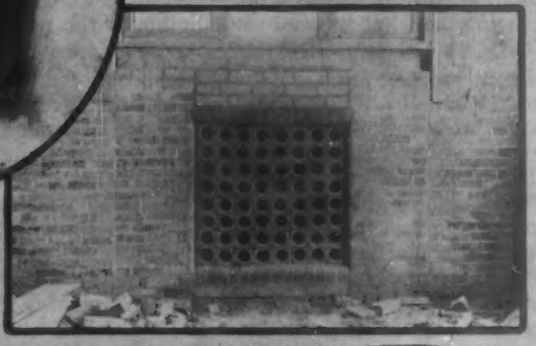
Showing aerial wires at Second South and Main streets, November, 1903.

Main manhole showing ducts entering south end from cable vault.

Manhole under construction at Second East and First South streets.







Cable vault, showing ducts entering from street.

Main line of ducts on State street.

Removing concrete with an Ingersol-Sargent drill.

GENERAL VIEWS SHOWING CONSTRUCTION OF UTAH INDEPENDENT TELEPHONE COMPANY.
Center view shows tunnel work conduit under canal.

and the general public are entitled to and of which they are requested to avail themselves.

One of the many contributing causes to the success of the Independent telephone companies throughout the country is the fact that they were the first to recognize the value of the "information bureau" to the subscribers and the public. The bureau is maintained day and night, and while in large exchanges it requires a large force of clerks, and consequently is a large item of expense, its cost is secondary compared with its value to both the subscribers and the company. It makes a subscriber's telephone something more than a mere instrument of communication. It becomes his servant and friend—*not a luxury, but an absolute necessity*. The information bureau is destined to be the most popular feature of the splendid service and facilities which the exchange is so completely equipped for.

The remaining position of the desk is known as the trouble desk. Subscribers wishing to report their lines or instruments out of order, operators discovering trouble either on subscribers' lines or with their position, all report to the trouble clerk, who makes such tests as she is competent to make, and if necessary reports the trouble to the wire chief, who tests and locates it. The necessary apparatus is provided to enable her to rapidly test and locate the trouble, thus preventing annoying delays which frequently occur in telephone exchanges. Troubles will occur, but up-to-date methods of construction, maintenance and operation have reduced them to a minimum.

Next to the information desk, and one that is of great interest, not only to the layman but to the telephone expert as well, is the supervising or monitor's desk, which is located in such a position that an instantaneous and complete view of the entire switchboard can be had by the person occupying the desk. The object of the desk is to supervise or "keep tab" on the service and the work done by each operator. This is indicated by various colored lamps which, when in operation, form a kaleidoscopic grouping of colors, puzzling to the layman but perfectly intelligible to the person seated at the desk.

From each position on the switchboard there converges into the monitor's desk hundreds of lines, over which are transmitted various signals, which are indicated on the different colored lamps, mounted in the desk. A subscriber's call on any position on the switchboard is instantly indicated on the monitor's desk on the white light corresponding to the position that the call comes in on. The moment the call is answered by the operator, this extinguishes the lamp. The monitor's lamp is also cut out, giving her an opportunity of knowing just how long it required the operator to answer the call. When the conversation is finished and the red lamp on the cords with which the connections were made appears to the operator, a red lamp likewise appears on the monitor's desk indicating that the parties have finished talking, and enabling her to know if the operator made the disconnection at once, as is required. When a subscriber flashes the red lamp on the cord the monitor knows it instantly and can observe if the operator is giving him prompt attention, as she is required to do. The way the operator rings the calling subscriber is indicated on the monitor's desk.

In addition to the above and various other devices and means for facilitating and observing the operations of the service the monitor can instantly detect it if an operator listens in on a connection, an offense that will subject her to instant dismissal. She can listen to the manner in which the operator answers subscribers' calls, or her conversation with subscribers—another cause for dismissal, by the way—and all unknown to the operator. She can, if desired, speak directly to the operator, giving her advice or instructions, and is, as her title indicates, the monitor of the entire operation of the exchange.

It will be readily seen that the operators are prompted to use their best efforts, knowing that someone is thoroughly in touch with their work, ever ready to assist them, if need be, but ever watchful of all that goes to make up the slogan of the Independent telephone companies—"Good service." Every person works better knowing that there is someone watching their efforts and able and ready to appreciate their endeavors.

The whole machinery of the operating department is adjusted to move in that harmonious and perfect action absolutely necessary for the successful conduct of the exchange in its close relation with the subscribers. A perfect unity of purpose and an enthusiastic co-operation on the part of every employe of that department, as well as of every department of the company is instantly recognized the moment the visitor enters the building. The elaborate and thorough manner with which the comfort and convenience of the employes have been recognized and catered to is certainly a step in the right direction, and one that is destined to be far reaching in its effects toward that pleasant and successful relation between employer and employe. Some doubting mortals carp and criticise, but the successful enterprise is the one where unity of action, enthusiasm and equality of rights is recognized by both employer and employe.

It is fitting that this should close the visitor's impression and one is compelled to congratulate the company upon its splendid achievement. The visitor to the exchange is impressed with the substantial appearance of everything, indicating that neither money nor effort has been spared to make the exchange complete in all its details. The care and solicitude that has been devoted to making everything comfortable for the operators indicates a spirit of progress and enterprise on the part of the company that other telephone companies might well emulate. Demanding from the operators a rigid discipline and strict attention to duty it is but fitting that everything that can possibly be done to make their work attractive has been recognized and provided for here.

The expensive facilities so adequately provided are in keeping with the outside construction and serve to render possible the preservation of a satisfactory and uninterrupted service to subscribers, only possible with such a magnificent plant. The whole enterprise reflects great credit upon all who are engaged in any way in contributing to its success.

TELEPHONE SKETCHING CAART.

An ingenious chart has been designed, and is being issued by Messrs. W. T. Glover & Company, Ltd., of Manchester, England, for the use of persons who wish to transmit sketches by telephone in cases of urgency; this novel proceeding is accomplished by means of sectional paper, with the ordinates and abscissæ numbered in order. The drawing to be transmitted is sketched down on the chart, and a description is written out giving the co-ordinates of the beginning and end of each straight line, the center and radius of each circle or curve, and so on; this description is then read out and received by telephone, and from it the sketch can be reproduced on a corresponding chart at the receiving end, "by a clerk of average intellect." It will be seen that the principle of the method is one familiar to engineers, and there is no reason why any difficulty should be met with in putting it into practice; mistakes will almost certainly be immediately detected in the act of reproducing the design from the verbal description, and can be rectified by a further recourse to the telephone. In emergencies it is often important to reduce to the utmost the loss of time in transmitting a drawing, and by this method it would be possible to order a piece of mechanism or apparatus from a distant workshop in the afternoon and receive it next morning, instead of writing a letter and waiting for two days.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

754,553—C. S. Ellis and F. D. Powell. Automatic Register for Coin Controlled Machines.

This is a device for causing each coin deposited in a toll machine or a telephone pay station box automatically to record the fact of deposit, the record being made for instance on a tape, which afterwards serves as a check on the amount returned as deposited in the box. The mechanism comprises a feed roll carrying the tape, which passes down between a toothed drum and a friction wheel into the coin box, and a release mechanism for the drum actuated by the dropping of a coin. The feed drum is driven by a spring train, and controlled by a detent extending into the path of coins. The tape is graduated like an ordinary tape measure, and a unit division is fed forward into the money box each time a coin is dropped. Each tape has a distinctive number at intervals on its back, and as the graduations on the front are all consecutively numbered, auditing is rendered possible by simply comparing consecutive pieces of tape, each torn off by the collector when he takes up the money. Each collector turns in a piece of tape from each box along with his money, and the check cannot be "beat," because the several pieces of one tape must match. If the first piece shows numbers 1 to 17, and the second piece turned in shows 25 to 40, this means that the collector has suppressed an intervening piece of tape, and has put eight coins in his pocket.

This patent was overlooked at the time it was issued, being classed in vending machines.

767,489—F. R. McBerty. Telephone Support and Switch.

This is a very simple and rather neat design for a compact wall-set. By this I do not mean the usual so-called "compact" type, but a really compact set about six inches in diameter and two inches thick. It has a circular back plate, on which are mounted the usual contact springs of a switch hook for common battery, the switch-hook in this case having its forked end bent forward and its long stem or spindle lying in bearings across the back plate parallel with the springs, and with a finger on one end that works the latter as the hook is moved up and down. There is no invention in the device, but some good designing.

767,573—J. W. Lattig and C. L. Goodrum. Party Line Ringing Device for Telephone Switchboard Circuits.

This is a party line ringing key, whereby generator may be put to one side or the other of line. The regular ringing key is employed at *K'*, which severs the cord circuit as usual and puts generator on the calling plug. In addition to this there is a so-called "master-key" which determines the manner of connection of the generator to the ringing key. There may be one or more of these master keys to an operator's position, and it is quite desirable that the master key be locked against movement as long as a ringing key is down. To accomplish this, a latch *N'* is provided, controlled by a magnet *N*, the circuit of this magnet being common to all the ringing keys which the master key serves, being closed when any of them is down for ringing, holding its latch locked and thereby preventing the master key from moving.

767,584—C. T. Mason. Telephone Hook-Switch.

This invention hails from Sumter, S. C. If my recollection serves, the present switch is an improvement over one designed several years ago by the same inventor, in which the tail of a lever made an excellent contact with a very small movement by lifting a spring off a fixed post upon which it pressed with considerable force. In the present case the support of base of the hook carries two insulated stops upon which the talking and signaling springs alternately come to rest as the hook lever moves an intermediate spring up and down between them.

767,753—C. W. Harper. Telephone Transmitter.

There is no affliction of a chronic nature which can cause more actual and poignant suffering than deafness. The loss of sight by itself does not cut a person off from his fellow beings, with whom he can still commune, and from whom he receives a sympathy often denied to those deprived of hearing. Human nature is such that patience fails with the apparent failure of intelligence on the part of those addressed; and the same instinct which causes us to shout at a foreigner because he cannot understand our English, stirs our bile when we try to talk to deaf people, unless we are very sweet tempered indeed. Instead of receiving the care and extra attention to which their unfortunate condition entitles them, the deaf are too often cut off from ready companionship and all unknown to those around them lead a dull and most sequestered life.

Any individual who contributes to the softening of these conditions, no matter how little, is entitled to respectful treatment and consideration. Some concerns have been advertising of late apparatus which they claim is "marvelous," etc., and their methods of advertising are somewhat blatant. Their apparatus is not marvelous, and all that any of these people have done is to put together old and common telephone transmitters and receivers so that the receiver repeats in a deaf person's ear with supposed greater intensity the speech of a person addressing a microphone. The present case is another of these, having some details which may be novel, such as a diaphragm clamped in a peculiar way between knife edges, but in the main comprising a transmitter of the solid-back type, having a front plate and a bridge, and an ordinary head band receiver connected therewith, together with a pocket battery.

It is a question whether there is any increase in the loudness of sound transmitted this way, but if any good is done at all it is that much clear gain.

767,818—W. W. Jacques. Telephone Circuit.

Nearly everybody has heard of Dr. Pupin's "loaded line" invention, whereby telephonic transmission over very long circuits without distortion is supposed to be possible. The invention in the present case has the same object, but the inventor goes about the attainment of his object in a very different way. In the Pupin case the inductance of the line was increased to balance the capacity by the insertion of coils of a given number and at given recurring points in a wave length. The invention lay in the discovery of the proper number and the proper points. In the present case

Dr. Jacques builds a circuit like a ladder, increasing the "shuntage" across the line by connecting resistance across at certain intervals. The limits of this digest unfortunately will not permit a lengthy discussion of the exceedingly interesting specification, which evidences both careful study and attention to practice. If the claims of the patent are borne out in reality, the patent will become a landmark.

It is understood that there are two effects which militate against the correct transmission of speech at long distances. One is distortion, and the other attenuation. In telephonic transmission depending upon the combined travel of waves of different lengths and different characteristics, we find that some of these waves are accelerated more than others. Thus in ordinary copper long distance circuits the high pitch undulations are accelerated more than those of low pitch. The effect of their unequal velocity is to distort the normal shape of the syllable waves which they make up. This may be likened to the distortion in a cylindrical or concave mirror for light waves making up images. Further, the same properties of the circuit which accelerate the little high pitch undulations, enfeeble them more than they do the larger low pitch ones, and often extinguish them entirely, so that the sound issuing from the receiver has no more meaning than the muffled boom of a voice in a barrel. By attenuation I mean loss of loudness, and this will take place in any circuit at great distances, even in a distortionless circuit, however, but it is stated that in a quiet room it is possible to hear and understand over a distortionless circuit words only one thirty-thousandth as loud as those originally spoken into the transmitter. Consequently attenuation is not so important to consider as distortion.

Dr. Jacques treats this subject mathematically, first assuming New York and Chicago as being enclosed inside the ends of an enormous egg-shaped mass of metal having certain electric and magnetic properties. After showing that this would conduct all waves with the same velocity, and without distortion, he carves chunks out of his egg, and pares it down until he gets a ladder, the sides of which are two metal wires between New York and Chicago, and the rungs are shunt wires bridged across at intervals. The wires and shunts may be of copper, but they must have some magnetic properties, and so they are coated with nickel, or with iron and nickel, that is to say, nickel-plated. The wires are not only plated but preferably annealed down to freezing temperature. The bridges are preferably produced of non-magnetic material, that is, the shunts are non-inductive. Thus each bridge may be formed of plumbago or black lead rubbed on paper between terminals, the paper then being varnished and boxed in to protect it.

Specifically stated, a line between New York and Chicago built according to this invention would be as follows: Line wires No. 12 copper, nickel-plated to about .01 of an inch; line wires suspended twenty inches apart on poles, and at points ten miles apart cross-connected through resistances of plumbago each of 36,300 ohms. Resistance of line wire, 4.59 ohms per mile; inductance of both wires, .0248 henries per mile; capacity of line, .0075 microfarads per mile; shunt conductance, .00000276 ohms per mile. This circuit of about 1,000 miles in length is supposed to be distortionless.

For cable 100 miles in length we would use No. 20 wire, with resistance of 45.9 ohms per mile, plated with nickel iron alloy to an inductance of .248 henries per mile, the two wires twisted and spaced so that mutual capacity is .075 m. f. per mile. At points a mile apart the two wires should be cross-connected through a plumbago resistance of 36,300 ohms. Here the shunt conductance of line is exactly ten times that of the overhead line, and in fact combining cable with overhead line it is exactly as if ten miles of pole line were telescoped into one mile of cable, or if in the New York-Chicago line there were twenty-five miles of terminal cable, this would represent 250 miles of pole line. Dr. Jacques says that generally when the cable constants and pole line constants bear a definite ratio, there will be no "reflection" at the joints between the two lines, and the above line would be distortionless.

Claim 1 of the patent reads as follows: "A telephone circuit in which the product of the telephonic resistance and capacity is so balanced by the product of the telephonic inductance and shuntage as to be substantially free of distortion."

It is to be noted that with all the use of shunts, Dr. Jacques still depends upon increased inductance in the circuit.

767,900—J. C. Lee. Insulated conductor and process.

This invention relates to coating wires with liquid insulation and then drying and baking the same on by hot air. A solution is made by dissolving ten parts by weight of celluloid in 250 parts by weight of wood alcohol. A separate solution is then made by dissolving fifty parts of shellac in 250 parts of wood alcohol. Fifty parts by volume of the celluloid solution and ten parts by volume of the shellac solution, with forty parts by volume of wood alcohol, are then mixed together. A sufficient amount of aniline dye can be added to color and distinguish wires.

In applying, the wire is run through the final solution after going through a cleansing solution of benzine or naphtha. It is then run through a drying oven, again runs over rollers and through the solution, through a second drying oven through which hot air is passing, and then is wound on a reel. The particular purpose which is mentioned for this wire is the formation of subdivided cores, as for induction coils and the like.

The patent belongs to the American Telephone and Telegraph Company.

767,953—F. R. Parker. Telephone system.

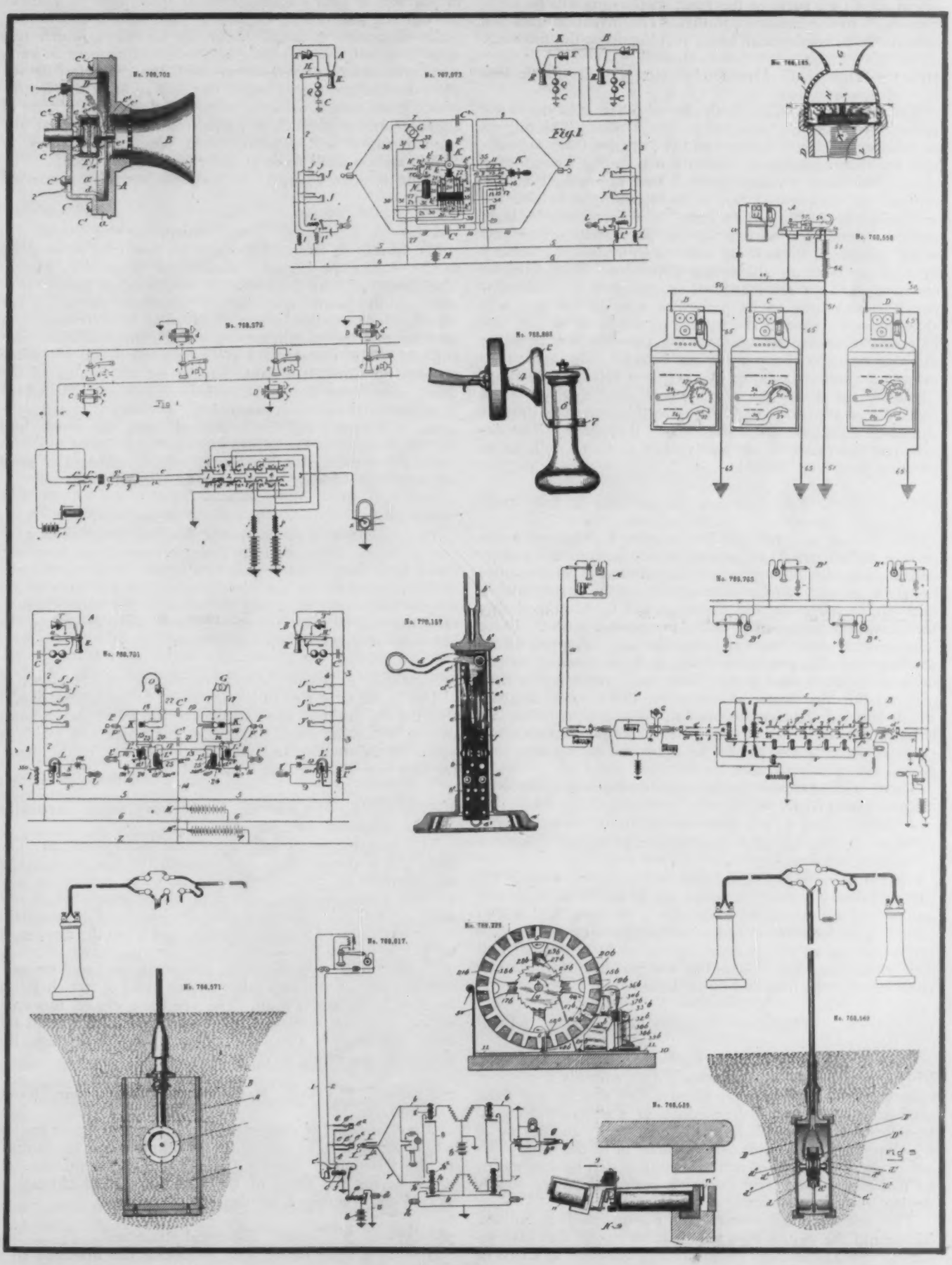
This is a common battery system, which may be used for multiple boards and which has its line relays control both line and supervisory signals. Each line relay has two armatures on the same end, one outside the other. The first armature when attracted breaks a battery branch to a third spring in each jack, with which the supervisory signals are connected when a plug is in. The second armature when attracted closes the line lamp circuit. Each cord circuit has a coil connected to battery, which shunts the line relay winding when a plug is in the jack. The outside armature then falls off, breaking the line lamp circuit. When the subscriber hangs up, the relay lets go its other armature and thereby closes the supervisory circuit for clearing out.

768,039—J. S. Ford. Telephone exchange apparatus.

This is a cordless switchboard. An incoming line has a magnet controlling a target *n'* for a signal, this being locked up when attracted by a latch controlled by a release magnet *n*. The setting magnet gets current momentarily when subscriber calls, and the release magnet is energized when connection is made with the line. The lines, together with operator's telephone and ringing generator, are connected through series of cams with contact springs, all cross-connected, so that the operation of certain given combinations of cams will connect certain lines of circuits.

768,185—J. W. Kurtz. Telephone.

This is a microphone transmitter having two vibratory diaphragms, with a third diaphragm between, which may be of carbon. Between the middle and the rear diaphragms a mass of granular carbon is confined by a surrounding ring or cup supported on the inner diaphragm. The middle diaphragm is centrally supported on the front diaphragm and has a number of wire filaments extending up from its surface, with platinum or other points touching different points on the inside of the front diaphragm. The idea is that



vibrations of all parts of the front diaphragm will be communicated to the filament contacts. The invention does not seem to be in commercial form, judging from the drawing.

768,272—Thomas C. Drake of Malta, Ohio. Party line telephone system.

This invention is in line with several others relating to the same subject recently patented by Mr. Drake. The ringers at four stations on a line are in ground taps from opposite sides, without condensers, the magnets being wound very high. The parts are arranged so that the weight of the clapper and clapper rod can be depended upon to bias the armature without the usual spring. The bells are selectively rung by alternating current having alternately strong and weak pulsations, these being secured by connecting battery in multiple with an alternating generator. The selective cord ringing keys are connected so that each key will connect the alternator to its particular side of line and will simultaneously connect the battery to the same side of line in proper direction to reinforce the alternating current on the plus impulses if a positive bell is to be rung, and to reinforce the minus impulses if a negative bell is to be rung. The diagram shows the arrangement very clearly. Each battery has a choke coil in its circuit in order to prevent shunting the alternating current back through it. The device has the merit of simplicity, and if found reliable in practice should be valuable.

768,541—E. E. Ries. Means for intensifying telephonographic records.

The Poulsen telegraphone is now quite well known, comprising a phonographic apparatus which depends upon magnetizing a steel wire to different intensities as it passes across the polar extremity of a receiver magnet in circuit with a microphone. The present invention has to do with means for increasing the intensity of the reproduced sound. Three wires are fed along under the points of three magnets whose windings are all connected with the same transmitter, so that three records are produced. Three receiving magnets then pick up the three records and affect three other magnets which impress the three records all on one wire. This last wire then travels across the pole of a final reproducing magnet, which is affected by the composite record, it is supposed, with great intensity.

There would appear to be considerable losses involved in this system of transfer.

768,547—B. W. Speck. Telephone and signal apparatus for railway trains.

This is a combined signal bell and telephone system for use on railway trains. A telephone is placed in each car, and one in the cab of the locomotive. A signal bell is also placed in the locomotive, and a pair of circuit closers in each car consisting of tilting arms controlled by the usual pull rope along the roof. Couplings are provided for the circuits between the cars and to the locomotive.

768,558—W. S. Burnett. Electrical selecting or individualizing instrument.

This is another step-by-step selective party line scheme. The object is stated as to provide means whereby a series of differentiating elements may be advanced step by step from a distant point through the medium of a series of electrical impulses and adjusted in operative position by another series of impulses either of different character or of the same character over a different circuit; also to use step by step means to make and break any one of a series of power supply devices at various stations.

The selecting instruments are all operated in unison. These and the switch keys are all alike, except that each selecting key *34* has rider projections *37* different in shape or in position to each station. One of these keys *34* controls the call bell and talking circuits at each station and is normally supported to break circuit by its riders, which rest upon a series of carrier-pins capable of adjustment in various permutations corresponding with the characteristics of the riders of any given key. The operation of the instruments from central or some other point adjusts the pins in all the stations to such a position that the riders at the wanted station will be unsupported, permitting the key *34* at that station alone to drop and close the bell circuit. The stepping is done as usual by magnets normally connected to line.

768,568—A. J. Mundy. Sound transmitter and receiver.

Mr. Mundy is from Boston and his invention is assigned to the Submarine Signal Company of Waterville, Maine. The invention is an improvement over another already presented to the patent office, but for which the patent has not issued. It comprises a couple of solid back transmitters enclosed in a spherical water-tight shell, which is filled with a liquid. The transmitters are connected by circuit wires passing up through a cable having its end sealed to the shell, to receivers above the surface of the water, in which the transmitter sphere is suspended. The idea is to catch the tones of a signal bell transmitted through the water, and the diaphragms of the transmitters are preferably tuned to the note of the bell. The inside of the transmitter shell itself is filled with air under atmospheric pressure.

768,569—A. J. Mundy. Telephone transmitter.

This invention is similar to the one just noted in its general features. Here we have a single transmitter, however, like a solid back button with two stems. This is enclosed within a drum whose heads are diaphragms and have spring fingers frictionally engaging the stems of the transmitter, so that they can be relatively moved, as by wave motion, without risk of breaking the connection.

768,571—A. J. Mundy. Sound transmitter and receiver.

This is the same sort of a contrivance as the others, except that the transmitters are enclosed within what the inventor calls a resonating tube, which contains water and which is supposed to intensify and magnify the sound. In the drawing this tube or resonator is marked *A*.

768,617—J. L. McQuarrie. Supervisory signal apparatus for telephone switchboards.

This is a two wire multiple common battery system. The battery *b* is connected to line through the line relay *a* and the contacts of the cut-off relay *c*. The battery is also bridged across the cord, and is of course grounded on one side. When the subscriber calls the line relay is energized to the exclusion of the cut-off relay, and when the answering plug *f* is inserted the cord battery sends current through the cut-off relay over the sleeve side of the cord and through one winding of the supervisory lamp relay *h*, which lights its lamp if the line is open. The line being closed, however, at the subscriber's station, the relay *i* in the tip side of the cord gets current also, and closes a branch through the neutralizing winding h^2 on the relay *h*.

768,768—T. R. Owen. Hygienic appliance for sound transmitters.

A roll of paper is supported on a bent metal frame having a hole through it, to receive the mouthpiece and be clamped to the transmitter thereby. The paper feeds off the roll down across the front of the mouthpiece and through a slotted clip whereby it can be torn off as used.

769,057—G. S. Carson. Electrical choke coil.

This is a right clever idea, involving the insertion of a

choke coil for lightning in an outside line, the coils being the acme of simplicity and excellent in design. It consists of a porcelain tube with an iron rod run through it forked at each end to take a porcelain insulator pinned in the fork. The line wire is brought to one insulator, given a turn around it and twisted once or twice about itself to take the strain, then wound around the tube from end to end, then to the other insulator and then to line. The line wire is grounded on the exposed side of this coil. Mr. Carson hails from Iowa City, Iowa.

769,084—W. A. W. E. Hjorth. Contact for telephone or like circuits.

Mr. Hjorth lives at Tegnergatan 6, Stockholm, Sweden. This is a button upon which to hang the Swedish receiver, which is a watch case instrument with a long handle and an eye on the top of it to hang it up by. Anybody who has ever tampered with the ordinary push button in use in all our houses knows that if you tilt the button it will close the circuit and ring. Mr. Hjorth takes such a button and puts a long enough teat on it to hang his receiver on, thereby tilting it to change the circuits, as in a switch-hook.

769,125—E. E. Yaxley. Telephone substation outfit.

The invention in this case resides entirely in a sound dampener for the gongs, brought into action when the hook rises, and the intention is to obviate the annoyance due to the continued sounding of the gongs after answering a call. A pivoted lever has dampers on its ends, and when the hook goes up it pushes these dampers against the gongs.

769,228—J. K. Norstrom and H. M. Graif. Electric Circuit closer.

This is a transmitter for automatic systems, consisting of a series of wheels each driven by its own spring and separately movable for setting, but each adapted to trip the next wheel when it runs down. In setting the wheels do not make and break the circuit, but in running down they do. This is attained by the use of a bell-crank lever, one end carrying a friction roller and lying next the teeth of the wheel, the other end connected to one of the springs. To set the wheels the finger is inserted in the space between the teeth opposite the number desired, and the wheel turned until the finger strikes a fixed rail. In this it resembles the present transmitter of the Automatic Electric Company.

769,304—W. B. Churcher. Telephone.

Everybody that gets up a convenient combination of parts now-a-days, whether he solves any problems or not, starts immediately on a dead run for the patent office. It would be a good thing if a committee of experts could be appointed in all the arts to go over our patents, and then either buy or legislate out of existence by an act of congress all patents that do not cover real inventions, in the interest of the public. I am quite well aware that the Supreme court of the United States has stated that it is impossible to make a fixed definition for invention, but there are limits which even the Supreme court would recognize. The patent office can only discriminate in favor of the applicant if there is any doubt, and the rights of the public are often sacrificed by the issuance of doubtful patents which may interfere with legitimate business and involve needless expense for litigation.

The present invention is not without merit, but it is not to be classed with Dr. Jacques' distortionless line elsewhere noted in this issue. It comprises a compact intercommunicating telephone having a bell of the monitor type, a transmitter and a simple rotary switch mounted upon an elongated plate. Behind the transmitter is a bent wire switch-hook, on which is hung a very cheap and common type of watch case receiver. With the switch-hook is mounted a coil and a rubber strip for the terminals. A buzzer is also mounted on the set. All the inventor can set forth is "compactness of parts, a capacity for ready and simple attachment, and simplicity of construction."

769,306—F. E. Denzer and W. W. Black. Telephone or telegraph system.

This is another step-by-step party line scheme Each instrument is provided with a dial, a selecting disc and the usual lever and pawl mechanism engaging a ratchet wheel to drive a pointer around the dial and set the switch to close the circuit at the station wanted only. Release of the pawls returns all hands to zero. A complicated system of levers is shown to lock the receiver hook at idle stations, with means to break the selective circuit by the hook at the busy station, this circuit requiring a separate wire.

769,658—R. H. Manson. Telephone receiver.

This is a watch-case receiver having concealed or protected binding posts and a yoke which is so pivoted that it cannot swing down against them. The binding posts consist of blocks set in the rubber of the shell from the back, drilled transversely, to admit cord tips put in through lateral holes in the rubber, the binding screws being tapped in the blocks from the back of the shell and projecting therefrom very slightly.

769,701—J. W. Lattig and C. L. Goodrum. Two-wire multiple telephone system.

In this system, which is common battery, a polarized line relay is employed, current passing over the line as determined by the subscriber in making a call energizing and operating it. When a plug is inserted the potential on this relay is reversed. The main battery is divided unequally, and the normal connection to the relay and line is from the smaller portion. When the plug is inserted the larger portion of the battery is connected, reversely, and the potential of the relay side is therefore reversed, the smaller e. m. f. being overbalanced by the greater.

An ingenious arrangement is designed for the control of the supervisory signals. When the plug is in a jack, relays *L*, *L2* and *L4* are in series. If the subscriber has his telephone on the hook, the current through the relays is so attenuated by reason of high resistance of *L* and *L2* that *L4* will not attract its armature, nor will *L;* but *L2* will attract its armature and displays the supervisory signal. When the subscriber answers the current before flowing is supplemented by that to his station and return, and this increased current energizes the magnet *L4* effectively to pull its armature, shunting the relay *L2* and so retiring the supervisory.

769,702—J. W. Lattig and C. L. Goodrum. Telephone transmitters.

This is a high resistance common battery transmitter of great sensitiveness and high efficiency. It comprises two transmitters in series with each other, the arrangement resembling a solid back with a long button and a partition between the electrodes, with carbon each side of the partition. The partition is of carbon, and both the back and the front electrodes are mounted on mica discs, both being also mounted on stems, of which the front one is attached to the diaphragm in the usual way and the rear one is attached to the usual bridge. The carbon in both chambers is compressed at each vibration.

769,760—F. R. McBerty. Telephone exchange switchboard apparatus.

This is a testing scheme for Bell standard relay circuits. A supervisory relay in the calling end of the cord has its armature normally back, connecting the plug tip to the operator's set through a third winding on its induction coil.

When the subscriber answers, the relay pulls up its armature and takes the tip connection off the operator's set and puts it to battery to complete the cord.

769,761—F. R. McBerty and H. M. Crane. Relay.

This is a relay for common battery systems designed especially to save space on the relay tracks. Instead of having the contact springs along its top, as heretofore, it has the old fashioned contacts and a disc armature, all circuit connections and the contacts and other projections, however, being arranged along the "corners" of the relay. That is, as so much square space is allowed to each relay, and the tube is round, it pays to stagger all projections, setting them somewhat to one side, to fall below and inside the allotted "square." The amount of invention in the case is problematical.

769,763—J. L. McQuarrie. Apparatus for through ringing on telephone trunk lines.

The scheme herein is a comparatively simple one, but should be effective. A four-party selective key is connected in the cord at the far central station, and the answering operator in trunking the connection gives her order to the trunk operator over the usual order circuit, telling her which key to depress in order to select the party wanted. The trunk plug being once in the wanted springjack and the selective key depressed, the latter remains down, being held so by a magnet whose windings are in series with the supervisory lamp and take current as long as the plug is in the wanted jack. A relay is bridged across the incoming end of the trunk, which controls a local containing the magnet for working an ordinary ringing key. Hence after the connection is once set up, all the original operator has to do is to ring through with her ordinary key until the subscriber answers, each time she does so the current energizing the bridged relay on the far end of the trunk and working the ringing key to send proper current.

769,863—W. S. Haddock. Telephone attachment.

This is a combined shield and hook which is clamped to a receiver so if you want to leave the telephone a moment without hanging up to terminate the conversation, you can hang the receiver on the mouthpiece of the transmitter, thus supporting the receiver and at the same time covering the transmitter mouthpiece to prevent the overhearing of any private business that may be going on. This would be a good thing for St. Louis and Philadelphia politicians and for the gentlemen of the "cloth" in New York. They always want privacy.

770,157—C. L. Boyce. Telephone desk standard.

This is likely to prove an important patent, at least to some of the Independent manufacturers. It covers the essential features of the form of desk set which has lately come into wide use, and the claims seem to be controlling as to those features. Without saying whether the claims are valid or not, it seems certain that anyone using a hollow tubular standard with the contact springs, switchhook and transmitter-head all mounted on a removable strip or bar within the tube, should carefully consider the matter at this time.

The patent is assigned to the Western Electric Company, and Claim 2 reads as follows: "The combination with a hollow telephone desk standard, of a frame plate *b* fitted into the same from the top, a transmitter support and switch mechanism with the telephone-supporting-switch-lever therefor and the connection terminals, all mounted upon said frame plate, whereby the working parts may be removed as a unit from the hollow standard, as set forth."

The telephone deadhead is the sworn enemy of the dividend, and should be disposed of accordingly.

SUCCESSFUL ILLINOIS COMPANY.

The Ogle County (Ill.) Telephone Company, with headquarters at Rochelle, Illinois, has had an unusually busy season thus far this year, having built over fifty-four miles of metallic farm lines, and is now duplicating its toll lines across the county, putting up No. 10 BB. iron wire. This will require about forty miles of metallic line. Besides having installed over 100 farm telephones this company has enjoyed a steady increase in all its exchanges, having added 300 telephones to its system since the first of the year.

The Ogle County Telephone Company is one of the pioneer and banner companies in the Independent telephone

CONSTRUCTION CREW.

field, having exchanges in succeessful operation in every city and town of any size in the county, and can reach every postoffice or crossroads with toll or farm lines. Following is a table showing the relative difference between the Independent and Bell companies in Ogle county, and also showing how nearly the Bell has been driven out of the field by the Ogle County company, because of vastly superior service and reasonable charges for the same:

Population	TOWNS	Number of Ind. Telephones	Number of Bell Telephones
2,200	Rochelle	423	10
2,300	Oregon	330	40
2,200	Polo	335	50
1,200	Mt. Morris	134	Toll office
1,250	Forreston	170	"
200	Lindenwood	72	"
600	Creston	40	"
.....	Flagg Center (Farmers' lines)	118	.....
650	Steward	70	.....
1,000	Byron (Mutual connections)	169	Toll
	Total	1,861	105

The accompanying illustration shows the Ogle County Telephone Company's construction gang on July 25, 1904, just after they had completed a hurry-up farm line at Steward to get ahead of the Bell. The line was staked out Sunday, July 24, and bright and early the next morning the poles were hauled on the ground and two and three-fourths miles of metallic line was completed and a number of telephones installed the same day. It was the quickest piece of telephone construction work ever done in the county, and brought the Ogle company into greater favor than ever.

The Ogle County Telephone Company is officered as follows: President, H. Wales; vice-president, G. W. Hamlin; secretary-treasurer, A. B. Sheadle; general manager, Lewis Berve; assistant, Steve Kennedy.

Subway Construction

D. R. CRAIG

PART III.

PREPARATION OF THE TRENCH.

In good, firm soil excavation is comparatively easy and the trench will stay as excavated until the conduit is laid and the earth replaced. But there are sometimes other conditions which must be reckoned with. In a sandy soil or gravel the tendency is toward caving and sometimes this tendency is so great that provision must be made to overcome it. This is best done by sheeting the trench, in other words bracing it. In deep excavations the usual procedure is to drive planking down on both sides of the trench and hold it in place by cross braces, but as a rule trenches for telephone conduits are comparatively so shallow that this tedious and expensive method may be avoided by laying twelve-inch planks horizontally along each side of the trench well toward the top and holding them in place by cross pieces wedged in tight, or better still by screw braces, which are easily procurable, always ready and can be put in place and screwed up tight enough to withstand a heavy pressure of earth without the pounding necessary to drive a wooden cross-brace in place and the consequent likelihood of jarring the earth and causing a heavy cave-in. Sometimes where the tendency to cave is great an occasional upright placed behind the horizontal plank is required, and in rare cases the entire trench has to be braced as mentioned before.

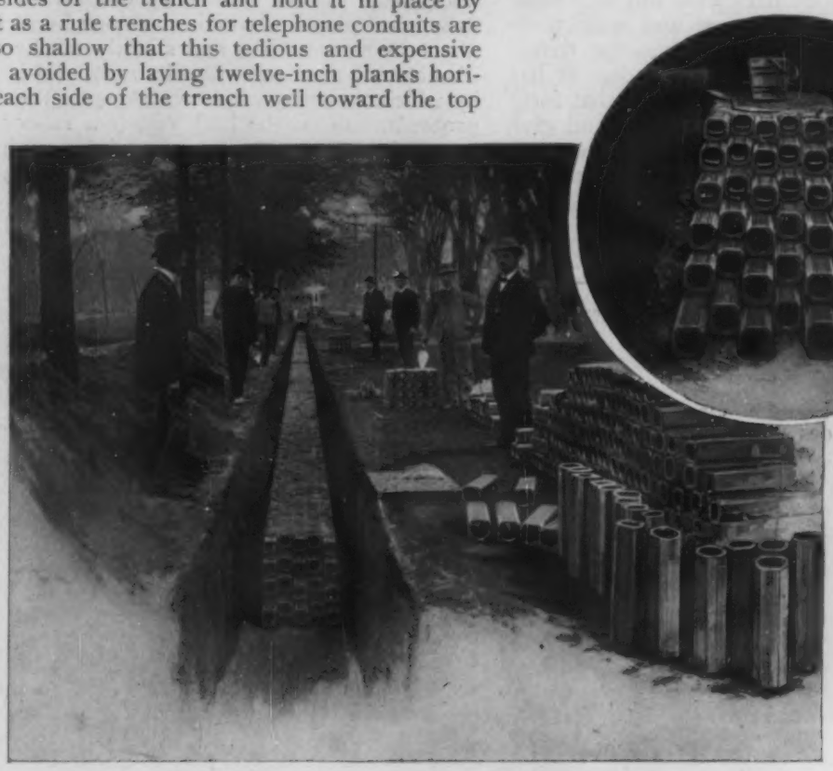


FIG. 6—LAYING CAMP SINGLE DUCT CONDUIT.

One of the greatest difficulties to be encountered in subway excavation is solid rock, and there is but one way to overcome it—by blasting. Great care for the protection of life and property must be used. Holes should be drilled in the rock in a line with the center of the trench, about six feet apart and to a depth a little greater than that required. If the trench is to be an unusually deep one the safer and better way is to make two blasts of it, taking out part of the rock on the first blast and then going to the required depth on the second blast. For this kind of work forty per cent dynamite is usually strong enough, though in some kinds of rock a little higher percentage can be used to better advantage, and this is best ascertained by actual trial. Where the drill holes do not exceed four feet in depth a stick or a stick and a half of dynamite to the hole is sufficient, but at a greater depth two sticks may be used in tight rock. Electricity should be used in all cases for setting off the blast. Electrical blasting machines are readily purchased and they have an element of safety not provided by any other means. In case the blast fails to go the lead wires can be disconnected in an instant and the work approached with impunity, which is not the case with a slow-burning fuse. Directly over the blast heavy timbers should be piled. These should be at least 16x16 inch oak and should be tightly bound together by heavy log chains. As many as possible of these timbers should be used. In blasting on business streets or close to store buildings all plate glass windows should be guarded by putting up planks in front of them to protect them from flying pieces of rock. When the blast is ready to fire all persons in the neighborhood should be warned and watchmen sent in every direction for a distance of a block from the work to prevent the approach of people or teams. It is a dangerous business at best, but one the subway builder is apt to encounter and one which he must be prepared to meet. With extraordinary caution the work can be done with a reasonable degree of safety. Once the blast is made the loosened rock may be quarried out to the extent required for the trench. In localities where rock prevails to a large extent there are always men who are used to that kind of work, and it goes without saying that they are the men to use in your work.

LAYING THE CONDUIT.

To give a clear understanding of the installation of underground conduit to the uninitiated, we will take as an example one block of work on a city street and show the methods of laying the different kinds of conduit therein, taking first the single duct vitrified clay conduit. (See Fig. 6.) The block is 400 feet long, with a sixteen-foot alley in the center, and the street is paved with brick on a concrete foundation. A lead of twenty-four ducts is to be laid and in the 400 feet are three manholes, one at each end of the block, designated as manholes No. 1 and No. 3, and a smaller one opposite the alley intersection, which we will call manhole No. 2. This is placed for the purpose of running a lateral into the alley to a distributing pole. Care should be exercised in the exact location of these manholes, taking into consideration that they are distributing or separating points for other leads, or laterals, and must be used for extending the line,

[Note.—The fourth and last article in this series by Mr. Craig will appear in our November issue. It will treat of manholes, distribution, labor and men, records and data, installation of cables and cable specifications.]

not only up and down the same street, but into side streets should the plans call for it or the occasion require. The lead should extend from one manhole to the next in a straight line if possible, but if a curve is found necessary to pass some obstruction, it should be slight and long. If the obstruction requires too much of an offset, extra manholes should be put in and straight lines adhered to.

We will say that previous investigation has disclosed that in order to avoid pipes already in the ground, the best location in the street for our work is a distance of six feet from the curb to the center of our trench. In putting in twenty-four ducts we would lay them six tiers wide and four high. Each duct requires 4⅝ inches of space and with three inches of room on each side of the conduit the trench would have to be, say, twenty-eight inches wide. It has been determined by observation and from records that forty inches is the proper depth to clear service pipes and give sufficient covering over our structure. We will also assume that there is a slight down-grade on the surface of the street from manhole No. 1 to manhole No. 3. By excavating the trench exactly forty inches all the way, we will have the same down-grade for the conduit from one manhole to the other, and this is as it should be.

FIG. 7—MANDREL FOR CAMP CONDUIT.

LAYING MULTIPLE DUCT IN TRENCH.

MULTIPLE DUCT IN TRENCH.

The excavation should be made as described in the previous article. This done, a layer of concrete three inches thick should be spread on the bottom of the trench the full width, and tamped smooth with a broad-faced iron tamp. We are now ready for the laying of the "pipe" or conduit. This is done by a mason, who should first stretch a line three inches from one side of the trench extending from manhole No. 1 to manhole No. 2. This line will represent one side of his conduit, which should be laid flush with it, though, should occasion require, conduits may be laid to vary slightly from a straight line providing there are no sags or pockets which will not drain themselves.

As stated before, a twenty-four duct lead of conduit would in this case be made or "built up" by laying the conduit six wide and four high. It could be laid six high and four wide, but in that case the trench would have to be deeper, to get a sufficient depth under the surface to the top of the conduit, as well as narrower. The first layer of conduit would be laid on the concrete foundation, care being taken to break joints so as to insure a maximum lateral strength to the completed structure. The conduit is laid lengthwise by butting the ends together. When the first tier is laid for several lengths, a thin coat of mortar should be spread on top and the second tier laid in the same manner; that in turn to be followed by the third and fourth tiers, all bedded in mortar. In spreading the mortar it is apt to ooze through the joints and project on the inside of the duct, setting and forming a hard projection there which might injure the cable or interfere with drawing it in. To prevent this and also to clean out any dirt that may have accumulated in the duct, mandrels are used when the duct is laid. These are cylindrical pieces of wood, as shown herewith (see Fig. 7), about three feet long and slightly smaller than the inside diameter of the duct. On the front end is fastened a hook by which they may be drawn along in the duct as the work proceeds, and on the back end is a rubber gasket, slightly larger than the inside diameter of the conduit. These mandrels lie in the ducts and at stated times in the progress of the work are drawn ahead by the mason, who reaches in and pulls them with a small iron rod about three feet long, having a hook on one end, which catches the hook on the front end of the mandrel. As these manholes are pulled forward the rubber gasket acts as a swab and cleans out the dirt and the wet mortar projecting through the joints, leaving a clean, smooth surface inside. Every duct should have its mandrel. The mason should be instructed to pull the mandrels forward at the proper periods, for if he neglects it he will soon be beyond the point where he can reach them with his hook, which necessitates some of the work being taken up to reach the forgotten mandrel, which would, if left, obstruct the duct. This seems a little thing to mention, but a mason, especially one new to the work, is apt to forget it until he becomes accustomed to it, and it makes a vexing delay that not infrequently occurs.

FIG. 9—CUTTING MULTIPLE DUCT CONDUIT.

Before the conduit is laid in the ground the inside of each piece should be examined, which can be done where it has been piled on the street. This is for the purpose of discovering any projections or burrs that may have been in the clay and burnt into the conduit. These sharp projections might tear or obstruct a cable and are removed by a tool called a reamer, which is provided by the manufacturer or purchased.

Two masons can work on a twenty-four duct lead, the first one laying part of the ducts, the second following him

up and laying the balance. In larger leads even a greater number of masons can be used, the work, of course, going more rapidly in that case. The duct is laid, as set out in the foregoing, from one manhole to the next. The method of entering and leaving the manholes with the conduit, and the construction of the manholes themselves, will be taken up in another article.

The object of surrounding subway conduits with a shell of concrete is in no way necessary to support the conduit, but is done to protect it from accidental injury from future excavations. There are not a few cases where the installation of a subway plant may be made without the use of this concrete shell. This is such a radical departure from the usual methods that it is apt to be severely questioned by many engineers. To these the writer would say that no one was more skeptical than he of the omission of what he then

FIG. 10—LAYING STONE CONDUIT.

considered one of the most important features of the work, but actual experience in the matter has demonstrated that in a great many cases the concrete may be eliminated without impairing the efficiency of the plant, and at the same time making a very great saving in its cost and the labor of putting it in.

Several plants constructed by the writer under these methods have stood every test put on them, and now, though five years in use, have yet to develop their first case of conduit trouble. Radical departures or improvements are generally brought about by experience, and the fact that the experiment has been successfully made tells the story. In installing subways under streets where there is a multiplicity of pipes which will require frequent future excavations and exposure of your work, the protection afforded by the concrete covering is advisable, but if your work lies well to one side of a street where there is little likelihood of its being disturbed by the installation or repair of other underground work, it is a safe proposition to do away with concrete. In the case of the single duct dry conduit where the concrete is omitted, the mortar should be made to thoroughly cover the top and sides of the duct, and in addition the top should be covered by one-inch planks, which will serve as a warning to workmen, excavating at some future time, that there is a structure underneath and care must be used.

In laying the fiber conduits the trench is excavated and prepared in the usual way and the duct laid on the concrete foundation. As the conduit is passed into the trench the ends of each length are dipped in a liquid jointing compound furnished by the manufacturer. The male and female ends are then slipped together, forming a self-aligning joint. The ducts are laid one-half inch apart, the spacing being maintained by small wooden separators, one-half inch thick by one inch wide and three inches long, stood on end between the ducts, one near each joint. The spaces between ducts and between the outside ducts and the wall of the trench are filled in with a thin grouting composed of one part cement and eight parts sand, followed up by a light tamping with a quarter-inch tamping rod to tightly fill the interstices between the ducts. The grouting of each row should be smoothed off flush with the tops of the ducts and the next row laid on this surface, placing the ducts so as to form vertical as well as horizontal rows. The top should

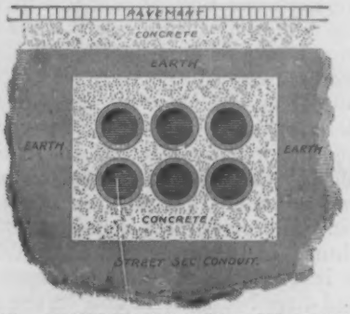


FIG. 11—CONDUIT IMBEDDED IN CONCRETE.

be covered with three inches of concrete. Where it is necessary for special reasons to use fractional lengths, the ducts may be sawed with an ordinary carpenter's saw, using water on the saw blade to prevent sticking. This form of conduit may also be laid without the use of concrete, as explained heretofore, in which case planking should be put over the top layer of ducts.

The creosoted wood conduit is the easiest and cheapest to lay. The trench is usually dug several inches wider than the number of ducts to be laid side by side require, though this is not necessary except to give working room. After properly grading the bottom of the trench, two-inch plank, preferably creosoted, is laid throughout its length for a foundation. The conduits are then put in in as many layers as are required, the ends being merely fitted together and driven home, without any further precaution for securing perfect joints, the conduit being self-aligning. In laying the tubes the joints between the different layers should be broken in order to give greater strength to the structure. The sides of the trench are filled in and thoroughly tamped as the work progresses, and after the required number of ducts are in place, another two-inch plank is placed above them, when the trench is ready for filling.

The installation of multiple duct conduit (see Fig. 8) does not require skilled labor and is rapidly done, from the fact that several ducts go into the ground in the same piece and at the same time. Under certain conditions concreting may be entirely eliminated in the laying of this conduit, and it is never necessary to concrete at the sides of the ducts, for their size, weight and hardness are sufficient to keep them in place. The units should be butted together in lay-

ing, the dowel pin being put in place first to assure alignment. This dowel pin is of iron, about three inches long with a nick chipped in the center to prevent its slipping into one piece of conduit without any hold on the next. It should fit the dowel hole snugly. These dowel holes run entirely through each piece of conduit, so that in case they have to be cut, to fit into manholes or finish out a run, the dowel hole will still be there for aligning purposes. The conduit may be cut by first tapping around it at the desired point with a cold chisel. (See Fig. 9.) The joints should be cemented and in order to prevent the cement from oozing into the ducts the joint is first wrapped with a strip of cheap muslin about four inches wide and long enough to surround the conduit and lap a little. The muslin should be wet before applying, to make it cling to the conduit. The ends of the conduit are scarified on the outside to furnish a firm anchorage for the wrapping. Sometimes tarred paper is used for wrapping the joints, but it is not so good as the muslin, or burlap. A two-inch cover of concrete is amply sufficient to use with this conduit.

The process of laying stone conduit is extremely simple. The stone used in the concrete for this work should be crushed finer than is usual, to enable it to lay snugly to the conduit and knit closer. Under ordinary conditions the bottom of the trench is concreted to a depth of from two to three inches. The conduit is then laid on this surface with one-half inch of concrete firmly packed between the ducts. If more than one row of ducts is to be laid in the same trench the top of the first row is covered with one-half inch of concrete and continued in the same manner until the required number of ducts are laid. (See Fig. 10.) The space at the sides is filled with concrete and the work completed with a top layer of concrete two or three inches thick. In using the mandrel method of joining units, the mandrel, which fits the conduit snugly, is placed directly at the joint and while in that position concrete is packed firmly around it. The mandrel is then brought forward and the work continued in the same manner. Where the self-aligning collar is used the mandrel is dispensed with and the pipe is fitted together as it is laid in the trench. (See Fig. 11.)

In laying the cement-lined conduit a concrete foundation at least three inches in thickness should be provided in the bottom of the trench and the conduit laid thereon. The various layers of ducts should be properly separated with concrete so as to obtain a distance of five inches between the centers of any two ducts. The structure should be made as nearly square as possible and all joints should be broken. The sides and top of the conduit should be covered with three inches of concrete to complete the job. Owing to the length of the units and the ease with which it is handled, this conduit is laid rapidly.

As a general thing, conduit should be laid so that the top of the completed work will be eighteen inches from the top of the street. No established rule can be made for this, however, as in some cases the job would be deeper and in rare instances closed to the top of the street. The depth given is sufficient to be perfectly safe and with no interfering conditions is a good average to take.

It is a good idea to close the ends of all conduit left open in the trench over night with wooden plugs made to fit the duct snugly. This prevents the entrance of dirt or water. It is also a good idea, for the same reason, to plug all duct openings in manholes.

REFILLING AND REPAVING.

In all forms of conduit work the method of refilling the trench is the same. This task of getting the earth back in the proper manner is not by any means the least important part of the entire job. Loose methods are sure to cause annoyance and expense in the future, for the dirt will settle, causing the pavement above it to follow, and this will result in complaints from city officials and the public, and the task of doing over, perhaps more than once, what should have been done right in the first place. The secret of getting a trench filled as it should be is contained in two words —tamp thoroughly. The space at the sides of the conduit must be filled first and has to be done carefully, owing to the small amount of room. All earth should be tamped in hard and solid. One man shoveling dirt into the trench to three men tamping is a good proportion, and even then the shoveling should not be done fast. This work should always be closely watched, for there is an inclination on the part of workmen to hurry the dirt in whether it is well tamped or not. Some builders "flush the ditch"—that is, pour water into the trench as the dirt goes in—but the writer does not advocate that method, for it is apt to make the earth spongy and result in subsequent settling. Dirt thrown back into the trench just as it came out, and thoroughly tamped—packed hard—makes the better job. If the pavement to be replaced is laid on concrete, the dirt should be filled in to a level with the bottom of the concrete, as shown on the sides of the trench. If there is no pavement, the filling may proceed to the surface of the street and then a slight crown of dirt in addition to allow for settling. All surplus earth should be hauled away promptly.

In the replacing of pavement removed for installing subway work, by all means do the repaving if possible, and do it promptly. Some companies and contractors leave this work to be done later, keeping the street torn up, creating a bad impression and giving just cause for complaint. The reason given is that they want to give plenty of chance for all the settling there will be before they put down the permanent pavement. If the filling and tamping has been properly done, there is little likelihood of settling, and even if there is, the writer would prefer to repave at once, cleaning the street up and allowing a resumption of traffic promptly, even if it were necessary to later raise the few low places that may have settled too much, by taking out the small amount of pavement necessary and filling up below with sand or concrete.

In some of the larger cities companies and contractors are not allowed to do the repaving, the work being done by a city gang retained for that purpose, the cost being charged to the company installing the subways. In this case the responsibility for the quality of the work is shifted to the city. A deposit is usually required by the city, before the street is opened, ample to cover the cost of repaving. In other cities where the matter is not covered by ordinance, the city authorities will often insist on doing the work themselves, the company paying the bill. This is usually an expensive proposition, for city labor is generally so mixed with politics as to be undesirable. As a result the work is poorly done and the cost high. In this case insist on doing the work yourself, and if your franchise calls for a bond to cover the proper replacing of pavement, your position is a secure one, for the city is amply protected by the bond, and you, having furnished the bond, should do the work.

It will be remembered that in opening the trench for excavating, the brick, wooden or granite blocks were piled along the curb, and the concrete from the foundation was thrown by itself. None of the ingredients of this concrete can be used again except the crushed stone, and to separate this the concrete must be screened. Several screens similar to sand screens, but of a much larger mesh, should be made and placed adjacent to the trench and the concrete thrown over them, the screenings being discarded, and the stone spread along the trench. Then sand and cement should be added to make the whole mass composed of one part cement, two of sand and five of rock. After thoroughly mixing, water should be added and the concrete shoveled off into the trench, filling it to a point about half an inch below the bottom of the brick forming the surface pavement. Tamp down the concrete smooth and even and allow it to set, when it is ready for the paving. This work should be done

by an experienced man, with several helpers to keep him supplied with material. A coating of sand should be thrown on the concrete and leveled off, leaving a slight crown in the center. All brick or other blocks should be cleaned off before being put down in the pavement.

When the pavement is laid, it should be very slightly higher than the undisturbed pavement on each side and should have a slight raise in the center. Following the paver a very heavy tamp should be used on the brick. This tamp should weigh from sixty to eighty pounds and should be handled by two men. They must not tamp directly on the brick, but on a two-inch plank laid on the pavement and moved as their work progresses. This tamping rams the brick down into place and makes the newly laid pavement more nearly conform to the balance of the street. Then sand should be scattered on the brick and swept into the crevices and another thin coating of sand put on and left, to work its way into the seams by the action of traffic. All refuse and dirt left must be swept into piles and hauled away at once, so that, as the paving is done, a clean street and a completed job is left behind.

Cedar and granite blocks are relaid in the same manner as brick. Repaving with asphalt must be by contract with some concern doing that work, for no telephone company is supplied with the necessary apparatus.

(To be continued.)

COST OF TELEPHONES IN 1903 IN PENNSYLVANIA.

Under the laws of Pennsylvania all incorporated telephone companies operating within its borders must render annual reports to the Department of Internal Affairs, whether chartered under the laws of that commonwealth or of some other state. When these reports are properly prepared they supply statistics of great value, but some of the reports received indicate either a lamentable carelessness in their preparation, or a disinclination to supply the information called for. However, Isaac B. Brown, secretary of internal affairs, is endeavoring to have each company make its report as complete as possible before it is filed in his office, to the end that statistics compiled therefrom for investment purposes may be full and accurate.

In his annual report to the General Assembly for 1903, Secretary Brown compiles the financial reports of eighty-seven telephone companies, as well as of various telegraph companies. Of this number, nine are companies identified with the Bell interests and seventy-eight are anti-Bell companies.

From the reports filed by these seventy-eight companies operating independent of and in competition with the Bell interests, the following interesting statistics have been compiled:

The total number of anti-Bell telephones reported in use by seventy-two companies was 62,077, while the total reported investment for these seventy-two companies was $19,839,045, or an average investment of $320 per telephone. The total investment recorded for seventy-six companies was $18,867,822, while the gross income recorded for the same seventy-six companies was $1,352,978, or an average annual gross income of seven per cent on each dollar invested.

The wide variation in the recorded investment per telephone in use presents an interesting study to advocates of lower telephone rates, and is accounted for in some cases by expensive local conditions, in others by improper construction, while some claim that it is due to the pernicious habit of charging into the construction account many items that should have been charged to current expenses through the maintenance account.

Nevertheless, this tabulation clearly indicates that the investment per telephone does increase as the number of telephones increases and that where flat rates prevail there should be an increase in rates, or the adoption of the message or measured rate service; that is, a fee for each call, after the manner that has proved so satisfactory in New York city, and resulted in placing 145,000 telephones in service in the boroughs of Manhattan and The Bronx.

Company.	Telephones in use.	Cost of plant.	Investment per tele.	Gross receipts from entire system.	Gross receipts per tele.
Albion	113	$ 10,700	$ 95	$ 1,371	$12
Armstrong	38	4,964	131	963	25
Bedford	200	6,580	33	2,000	10
Blairsville	203	10,015	49	3,294	16
Bradford	289	26,737	93	4,494	16
Cambria	215	39,250	183	3,026	15
Cambridge	367	22,000	60	5,553	15
Carbon	39	2,710	70	241	6
Carmichaels	145	10,356	71	2,123	14
Carnot	13	1,166	90	160	12
Chartiers	341	256	1	960	3
Citizens'	218	15,692	72	2,876	13
Citizens' Mutual	93	2,000	22	75	1
Clarion	275	31,756	115	4,999	18
Columbia	610	85,099	139	23,646	39
Conn.-Klondike	52	4,210	81	867	17
Consolidated	10,770	7,082,237	658	208,634	19
Confluence	8	998	125	57	7
Conneautville	350	26,000	74	3,585	10
Cowanshown'k	201	3,693	18	373	2
Cresson	82	5,627	69	1,920	23
Cross Fork	50	2,618	52	1,884	38
Cumberland	5,394	1,664,419	309	*	*
Delmar	95	2,000	21	212	2
Elk	470	24,346	52	6,637	14
Farmers' Ind.	192	5,215	27	166	1
Farmers' Tel.	28	2,071	74	179	6
Farmers' Mutual.	425	5,228	12	2,250	5
Federal	*	401,522	..	43,913	..
Forest	141	7,691	55	3,179	23
Freeport	100	4,147	41	1,613	16
Indiana	*	37,797	..	102	..
Jackson	31	1,133	37	1,069	34
Johnstown	1,740	383,925	221	39,928	23
Juniata	9	1,540	171	396	44
Kittanning	460	20,794	45	1,507	16
Liberty	48	992	21	*	*
Linesville	279	9,342	33	2,875	10
Lykens	147	28,013	19	3,792	26
Meadville	1,000	66,000	66	15,248	15
Monongahela	43	5,280	123	75	2
Monroe	28	2,884	103	344	12
Montrose	103	2,350	23	475	5
Mt. Pleasant	150	6,932	46	821	6
Mt. Morris	*	5,010	..	939	..
Mutual	*	202,577	..	39,257	..
North East	255	7,629	30	2,971	12
New Jersey	496	166,125	335	10,264	21
Newton	62	1,867	30	178	3
No. Cambria	54	5,000	93	720	13
No. East, Pa.	475	8,500	18	711	2
Orbisonia	7	450	64	10	1
Pittsburg	7,572	3,923,524	518	316,919	42
Rose	17	593	35	10	1
Satillo	*	5,000	..	922	..
Salix	196	12,262	63	3,806	19
Somerset	535	52,448	98	11,176	21
Somerfield	5	880	176	117	23
Southern	370	29,600	80	5,430	15
Spartanburg	80	5,000	63	1,020	13
Standard	745	216,100	289	11,331	15
Stroudsburg	247	14,845	60	3,142	13
Summerville	*	42,282	..	13,852	..
Susquehanna	200	4,669	23	1,847	9
Tunkhannock	116	13,000	112	613	5
Union	3,655	624,502	170	94,534	26
Un. States	23	22,945	998	672	29
United	18,114	4,578,897	253	373,011	21
Valley	195	11,346	58	1,607	8
Vandegrift	214	34,001	59	4,100	19
Van Pike	140	5,000	36	1,934	14
Warren	371	30,821	83	4,569	12
Wayne	36	1,643	46	241	7
Waynesburg	7	825	118	17	2
Westmoreland	198	21,073	106	2,043	10
Westford	97	3,872	32	392	4
York	2,010	401,572	200	40,482	20
York South	30	1,000	33	259	9
	62,077	$20,533,233		$1,352,978	

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OHIO'S SHINING EXAMPLE.

IN no state in the Union at the present time is the Independent telephone movement more clearly defined or making greater strides than in Ohio—the home of several of the strongest Independent organizations in the country, as well as of a large body of active, wide-awake, influential workers; and because of this unusual stir in behalf of the Independent cause the Buckeye state has become the center of interest and all eyes are turned that way, whence come reports of a most encouraging nature and a wave of activity, bearing with it needed inspiration, that is rapidly spreading and becoming infectious on all sides. Not that the Independent movement is now less widespread nor less progressive than it has been at any time since its inception and exploitation, but that in Ohio it has suddenly taken on a greater interest, which is bearing fruit in a splendid and most complete state organization and a getting down to practical, everyday working principles, that are making for still closer harmony and fitting the Independents to wage a battle that shall sweep all before it.

Ohio's recognition of the needs of the hour and moment is certainly worthy of the highest commendation on the part of all those who have the best interests of the Independent cause truly at heart, and it is fervently to be hoped that the brilliant example of aggressiveness now being displayed by the Buckeye brothers will be emulated far and wide.

Awakening to the fact that the monopolistic company is about to wage a bitter war against the Independents of the middle west, where the movement has assumed titanic proportions and has completely overshadowed the Bell interests, the Ohio Independents rose to the occasion and are fast perfecting an organization that is bound to make Ohio an impregnable state and strengthen the cause of the Independents everywhere. Difficulties in securing connections over intervening lines, and certain misunderstandings concerning rates, made it evident to the Independent men some time ago that some means must be taken to bring them into closer touch. The Buckeye leaders accordingly mapped and are carrying out a line of campaign that is unique and at the same time most effective, using the Ohio Independent Telephone Association and its auxiliary sections to materialize their plans.

That the best results might be obtained the state has been divided into nine districts, each presided over by a vice-president. For more thorough and effective organization and work, an auxiliary committee, composed of at least one representative from each county in each district has been chosen, and by co-operation of these representatives it is hoped that every Independent telephone company in each district will become a member of the association, and work as a unit in advancing the welfare of all.

The aim and purpose of this association is to cement together in a firmer union all Independent non-Bell telephone interests in the state of Ohio, for the purpose of promoting uniformity of operation, maintenance and construction, to protect and defend all Independent telephone companies, members of this association, by moral effort, co-operation and such other available means as may be deemed advisable to prevent the enactment of hostile legislation, promote the enactment and enforcement of laws that will encourage and stimulate development, and any and all other purposes that are deemed to the best interests of the members hereof.

At the recent meeting of District No. 1 in Cleveland, Vice-President J. B. Hoge outlined the plan of organization for the state as follows:

"Have each of the nine districts thoroughly organized, membership to be composed of bona fide Independent companies, who have no affiliations with any other competing company, each company to be entitled to a vote for each 100 telephones or 100 miles of toll lines they may have in their

system, the districts to elect annually one delegate to the state convention, the state association to consider the larger subjects that may be of interest to the Independent telephone interests of the state. In case this plan of organization should meet with the approval of a sufficient number of the Independent telephone companies of the United States, each state could then be organized along the same line. In this way the Independent telephone interests of the United States would be a unit."

Mr. Hoge gave as the four principal points to be considered by each district the following:

1. Importance of all companies adopting certain standards of equipment and operation.
2. Division of territory.
3. Guarding against a second Independent company entering the field.
4. Organizing to prevent any Independent companies becoming licensees of the Bell.

With such an organization as the above matters of vital importance to all Independent companies will be properly and promptly handled to the advantage of all. The long distance companies have taken the initial step in their efforts to standardize a system of accounting, and it is hoped that through the co-operation of the association standardization of equipment, as well as methods of handling business in all departments, may eventually be worked out and put into successful operation, thereby very materially reducing the volume of work which is now being done by each Independent company in its endeavor to make monthly settlements with neighboring companies.

The Ohio association is at present the most aggressive yet organized. The dominant purpose is to fight the Bell company at all points through the medium of this offensive and defensive alliance. The Independents believe that the Bell officials are preparing to make extensive improvements in all their subsidiary branches throughout the country to enable them to compete more effectually with the growing Independents. To meet this the Independents will form a closer compact at all points. In the past each individual company has in its own way battled with this giant corporation, and the success of this campaign thus far is substantiated by the fact that at the present time in Ohio alone, the Independents have more than 190,000 subscribers, while their adversary has less than 90,000, including the free list, which will quickly leave its ranks should it attempt to charge them for service.

With the many hundreds of hustling business men engaged in the Independent telephone business, their enormous resources and influences, complete success and mastery of the situation will be assured by concerted action of this tremendous power.

The Bell company has at last begun to realize the unpopularity of its course in the past, and to partially comprehend that the policy of the Independent companies is meeting with unexampled approval and support by the general public. It is, therefore, not only making an extraordinary effort to regain what it has lost in the cities, but is taking advantage of every available opportunity to demoralize the patronage enjoyed by the Independent companies in the rural districts by offering free county service and many other alluring and misleading propositions. It is this thing that the Independents of Ohio must combat in the future as in the past, only, if possible, with even more vigor and oneness of purpose. It is a fight to the bitter end; the Independents are in the right, have the people on their side and there is no question as to how the battle will go.

It is to be hoped that the "Ohio idea"—at least in the abstract—will spread into every state in the Union and that out of the agitation shall grow a national organization broad in its conception and mighty in its power. This is a matter that should be discussed at every state, district and county convention, and should be productive of decisive and favorable action—of the Buckeye brand. Now that Ohio has started the ball a-rolling, let other states follow her lead and organize along the same lines. It is a grand work and only just begun.

ANOTHER BELL SCHEME FAILS.

CONSIDERABLE of a sensation was stirred up in the early part of September among the Independents of the middle west, and particularly in the territory covered by the Inter-State Independent Telephone Company, by the report that the Inter-State had sold out to the Central Union (Bell) Telephone Company. The report appears to have originated at Peoria, Illinois, where the Inter-State is expending a large sum in improvements to its system, and was evidently put in circulation for the express purpose of making it appear to the people of Peoria that the Inter-State had made a failure in the Independent field and had been forced to dispose of its property to the Bell. It was hoped by those who spread the story (which has since been directly traced to a Bell source) to seriously injure the standing of the Inter-State, particularly in Peoria and other places where the systems were being extended, and cause the public to withhold its support. It was the same old story of the Independents going into a field, winning the bulk and cream of the business away from the Bell by up-to-date methods and real enterprise, and then having the Bell resort to its usual plan of misrepresentation in the hope of injuring the business of the newcomer.

The story of the alleged sale first appeared in the Peoria papers and was given wide circulation by the press of other cities. It was asserted, among other things, that the Bell company, through its agents, had secured some 80 per cent (a controlling interest) of the Inter-State's stock in the open market, unknown to the management of the Inter-State, and that, at an unexpected moment, it had stepped in with its credentials, executed a *coup de maitre*, and thus gobbled up the poor, unsuspecting Inter-State. It sounded well (from a Bell standpoint) and the only thing that prevented its being a reality was that it was a falsehood from beginning to end. Not in the least particular was there an iota of truth in the report. It naturally created a stir at first and the Inter-State officials at Aurora were overwhelmed with messages asking as to the truth in the matter. The prompt, ringing and emphatic denial that came from the Inter-State company proved the story a fake, pure and simple, originated by the Bell people to carry out certain of their plans, which utterly and ignominiously failed.

TELEPHONY directed a letter to the Inter-State company in regard to the matter and received the following reply from Edward R. Conklin of Aurora, secretary and general manager:

> The story that the Inter-State has sold out to the Bell is a falsehood in every sense of the word, and is the result of a desire on the part of our competitor to place us before the public in Peoria in a light that would do us as great an injustice and harm as possible. The fact that at our annual meeting on August 29 last A. B. Conklin, our treasurer, represented in person and by proxy *five-sixths* of the entire outstanding capital stock of the Inter-State company is conclusive evidence that the report that 80 per cent of our stock is in the hands of the Bell company is untrue. We are further pleased to say that we are in position to place our hands on practically every share of our outstanding capital stock, and that it is in the hands of the people who originally purchased it—those in touch with the management, and to the fullest extent friendly to its interests.

To the press Mr. Conklin made the following plain statement of facts:

"There is not a scintilla of truth in the report which has been widely circulated in the city press that the Inter-State Independent Telephone and Telegraph Company has sold either a part or all of its properties to the rival company in the city. Furthermore, I will make the statement that none

of the directors of my company have entertained a thought of any such move and the possibility of such a proposition is absurd."

This should immediately set at rest all rumors bearing upon the alleged sale of the Inter-State to the Bell. The former company, now that the Peoria hoax has been exploded, is more strongly intrenched in its territory than ever before, as the canard acted as a boomerang on the Bell in every town and city where the Inter-State is doing business and where the facts in the case became known. The Inter-State is a money-making proposition, and is assured of even greater financial success in the future. It has ample capital back of it, is splendidly officered, and in every contest with the Bell it has come out victorious. It is to be congratulated on having so bungling and short-sighted a competitor.

TELEPHONY AT THE ELECTRICAL CONGRESS.

THE International Electrical Congress at St. Louis, besides being the most remarkable gathering of its kind ever held, accomplished much in disseminating knowledge along electrical lines, not the least of which was in regard to telephony. The art of electrical speaking communication occupied a high place in the deliberations of this body, and much of value to telephone men was brought out in the scholarly papers read before the members of Section G.

Famous scientists and electrical men from all parts of the world were present, and while the central interest of many of these was in directions other than pertaining to telephony, still each and every one took occasion to inquire into the great Independent telephone movement that is sweeping the United States and Canada, and doing so much to advance the cause of telephony at large.

Some of the brightest lights in the telephone firmament contributed to the success of Section G, by reading papers on various subjects bearing upon the general theme of telephony. Among those who figured in this part of the programme were: Senor Don Julio Cervera Baveria, John Hesketh, Herr Joseph Hollos, Saitori Oi, M. G. de la Touanne, Franz J. Dommerque, Dr. Hammond V. Hayes, Prof. J. C. Kelsey, Dr. A. E. Kennelly, Kempster B. Miller, Col. Samuel Reber, U. S. army, Prof. George F. Sever and Leroy W. Stanton—all recognized authorities on the different topics which they discussed. It is doubtful if ever before such an array of talent was gotten together to discourse on telephony in its varied phases, and that the Independent cause will be still further advanced and the labors of the workers in the operating field lightened by the dissemination of the knowledge given in the papers in Section G is conceded by all. And in this good work TELEPHONY will have an important part—as becomes the leading telephone magazine in the world—by publishing these papers entire and giving our readers the full benefit of their valuable contents. The publication of these papers begins in this issue and will extend through the November, and possibly into the December, numbers.

MANAGING MANY INDUSTRIES.

A LITTLE pamphlet bearing the above caption (author's name not given) has been received by TELEPHONY, and contains so many good points on the use of the telephone in the home that we republish it in full:

The husband usually follows one special calling or profession. If he supervises many lines of work, he usually has competent chiefs for each department, and each chief studies how best to equip his department with every modern device that serves to increase efficiency and output.

Take the telephone away from the husband and how lost he would be without its efficient aid, how comparatively little would be accomplished, how much unfinished work would be carried over from day to day, how impotent his earnest efforts would often prove when depending for success on the prompt co-operation of others. Yet with the telephone removed the husband would still have the telegraph and the messenger call box to aid him, two public service functions that are unknown factors in the problem of housekeeping

Out of every one hundred American homes in only eighteen is there even a single servant to run to and fro, to assist in the seemingly endless duties that fall to the lot of the housekeeper and homemaker. Yet the home is a place of many and varied industries. And in eighty-two out of every one hundred homes the wife not only supervises every department but takes care of every detail.

With all these varied details of daily work to engage every moment of time from early morn till late at night, should the husband hesitate to place a telephone in the home to lighten the burdens of his wife? Is it not a penny wise, pound foolish economy that deprives the home of so valuable a time-saving, labor-saving utility as a telephone?

Varied are the industries of the home. (*a*) There is the kitchen or the chemical laboratory where the wife serves as chemist and cook, converting raw materials into finished products; a laboratory wherein a thousand meals a year are planned and prepared. With a telephone in the home the freshest of fruit and fish, of vegetables and of meats are easily and promptly secured, insuring wholesome and palatable dishes at every meal. (*b*) There is the nursery where character formation requires intelligence, discrimination and discernment of the highest character. With a telephone in the home time is saved and worry disappears. (*c*) There is the library or reading room utilized by the children as the place of preparatory study. With the aid of the time-saving, labor-saving telephone in the home the mother readily keeps abreast of the times and maintains the prestige inherent in her position. (*d*) The wife and mother often acts as a surgeon in treating minor surgical cases, as cuts and bruises, sprains and strains, lacerations and burns. (*e*) More frequently she serves as a physician, skillfully and correctly diagnosing and successfully treating the milder forms of infantile and children's disorders easily traceable to overeating or to lack of proper mastication. Or she steps to the telephone in her home and explains the case to the physician, who comes quickly to the patient's side. (*f*) And then she is often called upon to serve as nurse while taking care of all the other household duties. With a telephone in the home she can easily communicate the patient's condition to the physician and be warned in time or save the expense of the physician's visit. (*g*) The home is a workshop in which garments are fashioned and repaired. With a telephone in the home it is not necessary to lay the work aside in an unfinished condition and dress for the street for lack of material, for it can be quickly ordered by telephone. (*h*) It is a meeting place for social gatherings, dancing parties, card parties. How useful and available the telephone to cancel engagements at the eleventh hour in the event of illness.

THE TELEPHONE AS A TIME-SAVER.

THE New York *Times* in commenting on the telephone statistics of the United States, recently issued by the Census Office at Washington, does a little juggling of figures on its own account, and says in this connection:

From the figures given it appears that in 1902 there were something more than 5,000,000,000 of telephone messages exchanged in the United States. If it is assumed that half the messages sent were sent because it was merely convenient, there remain 2,500,000,000 of necessary communications, of consequence as affecting the business or social activities of the American people. To find out how much time was saved we must assume an arbitrary average. On long distance messages this might run into days for each communication. On nearby calls it might be but minutes. If we assume, as we may safely do, that the saving of time on each necessary communication in asking the question and getting an answer, or on imparting or receiving information, will average at least ten minutes by telephone over any other available agency of communication, we find that the saving on the 2,500,000,000 of messages of the exigent and important class exchanged in 1902 was 25,000,000,000 minutes, or 416,666,666 hours, or 17,361,111 days, or 47,830 years.

If we allow fifty years for the maximum average of useful life, the ten minutes' saving on each of one-half the messages of the 1902 telephone service would aggregate the entire lifetime for purposes of work of more than 956 able-bodied men employed as messengers. By as much as we should vary the assumed average saving of time per message our totals would increase or decrease. Probably ten minutes per message is far below the figure which would be warranted.

Now that the esteemed statistician of the *Times* has figured out just how much the best of Old Father Time the American public got in 1902, will some kind friend who doesn't shy at mathematics please take his pencil and pad and tell us how much conversation, measured in syllables,

was fired through this country's telephones in 1902, and what sort of an explosion it would make if it were all let loose at once in a vacant lot?

A NOVEL TELEPHONE SYSTEM.

THE unique communal telephone system which has been established on the Island of Molokai, Hawaii Territory, contains a hint to the farming community which might be worth their while to apply to their own uses. A modified form of the system has been in use for a number of years in some of the fruit-growing and mining districts of the west, but it is far from being as fully developed in any of them as it is in Molokai. The miners and fruit growers, who are maintaining semi-independent lines, have only limited privileges, whereas the Molokai system is entirely under the control of the island community, every individual therein enjoying its privileges without expense other than the cost of caring for the lines, which the members of the community have learned to do for themselves. Besides, the Molokai system is joined to the wireless telegraph system of the territory, and through that with the Pacific cable, and as every house is supplied with a telephone, the whole community gets the benefit of the news of the world.

The system was built by the territorial board of health for the benefit, more particularly, of the leper settlement on Molokai; but when the legislature neglected to appropriate money for its maintenance the people assumed the responsibility of maintaining it themselves. It is operated without the assistance of a "central" station, and any telephone may be called up, the superintendent of the leper settlement being the only one who has the power to cut off any section of the circuit.

Perhaps the only telephone system existing anywhere approximating in correspondence that of Molokai is the one which the farmers of Illinois established some years ago. That was an Independent service in which the barbed wire fences on the farms were utilized as telephone lines. All of the farmers within a given radius were in the alliance, which was organized for mutual benefit and as a means of defense against the aggressions and impositions of the Bell Telephone Company. The Molokai system seems to be an improvement, however, on that adopted by the Illinois farmers.

TELEPHONES AND MANNERS.

AN ELABORATE set of rules devised by one of the leading Independent telephone companies in Michigan to facilitate the conduct of its business and protect its interests includes one, we notice with much satisfaction, that is calculated, so far as it goes, to teach good manners to a certain class of telephone users in the only way they are capable of understanding or are likely to heed—that is, by making them pay out money every time they indulge in their favorite form of impudence. The rule relates, also, only to messages of the sort for which subscribers pay a special fee. After stating that the charge on these messages will begin when the telephone called is connected with the telephone calling, the rule reads:

> Some subscribers are in the habit of sending an office boy to the telephone and having him insist on hearing the individual called before he calls to the telephone the individual who has put in the call. This frequently results in considerable loss of time. Subscribers who have a habit of doing this should be notified that they will be charged from the time that the individual asked for is connected with the other line.

The Michigan company, it will be observed, has succeeded in protecting itself from the losses which this abominable habit would otherwise impose upon it, but it doesn't seem to be worrying a bit about the innumerable unfortunates who, in the case of ordinary messages, are daily called from their work to the telephone, only to hear some underling say, "Wait a moment," and then to wait anywhere from half a minute to five until the boor somewhere in the neighborhood of the other end of the line finds it convenient to tell them what he wants.

These experiences are about the most irritating features of modern life, and they are rapidly lowering the average of nature among all civilized peoples. For even the folks who do the horrid thing rage when it is done to them, and of course everybody else is driven frantic by it. From this atrocity there is as yet no safety, but vengeance, adequate and most enjoyable, is within the reach of all. The man whose time is thus wasted should always restrain himself until the other fellow comes to the telephone and begins to talk, and then he, in turn, should suavely say, "Please wait a moment," and take care that the moment is a good long one before he resumes the conversation. To listen, meanwhile, to the other fellow's fuming and fretting causes a deep, holy peace to settle on the listener's heart, and makes life again worth living.

DE FOREST WIRELESS TESTS A SUCCESS.

AN event which marked an epoch in wireless telegraphy and which made history for this form of communication was the official test made between Chicago and St. Louis, September 14, of the De-Forest wireless telegraph system, by which communication was established between these two cities to the entire satisfaction of all concerned, the test, in fact, being successful even beyond the expectations of Dr. DeForest and his associates.

Previously, on September 10, an unofficial trial between the two cities had been made, at which a number of lengthy messages were successfully transmitted from the new to the old world's fair city, no aerograms being sent from Chicago, as the sending apparatus had not yet been installed in the station there. The test on September 14 was primarily for the benefit of the world's fair jury on telephony and telegraphy and the thousand visiting delegates to the International Electrical Congress, and incidentally that Dr. DeForest might demonstrate beyond all shadow of doubt the wonderful workings of his system and have the stamp of official approval placed on the tests.

The air-line distance between St. Louis and Chicago is nearly 300 miles and previously the overland wireless record was 107 miles, so the official tests of September 14 established an entirely new record. However, the De Forest company sent war messages from Chemulpo to Weihaiwei, China, over a dozen islands, the distance between the two points being 275 miles.

The De Forest wireless tower at St. Louis is situated on Art Hill at the World's Fair grounds and is 206 feet in height. The tower in Chicago is located at the foot of Oak street, on the famous "District of Lake Michigan," which skirts the lake front, and is of the same height as the World's Fair tower.

At the St. Louis end were the following electrical jurors in charge of the test: Gaston Roux, France, vice-chairman of jury; Prof. Alexander S. Lanpdorf, professor of electrical engineering, Washington University, St. Louis, secretary; Dr. Arthur E. Kennelly, professor of electrical engineering, Harvard University; A. I. da Costa Conto, Brazilian commissioner to department of electricity, St. Louis World's Fair; Dr. F. Benedict Herzog, electrical expert, New York City; State Director Dr. Kahle, department wireless telegraphy, German patent office, Berlin. In addition there were present Dr. Lee De Forest, the inventor; Abraham White, president of De Forest Wireless Telegraph Company; World's Fair President Francis, Professor W. E. Goldsborough, Mayor Rolla Wells, 1,000 members of the

International Congress and members of the press. The sending operator at St. Louis was F. E. Butler.

At the station in Chicago, in charge of operations, were two members of the electrical jury—Prof. James C. Kelsey, professor of telephony and electrical engineering, Purdue University, Lafayette, Indiana, and William J. Hammer, contracting electrical engineer, New York city, chairman of the jury. The De Forest company was represented by G. H. Barbour, M. E. E. E., executive engineer De Forest Wireless Telegraph Company, New York. Dr. De Forest was represented by H. M. Horton of New York, his chief assistant. Others present were Judson C. Smith, manager of Western Union Telegraph Company, Cnicago; Louis K. Whitcomb, chief operator Chicago office of Western Union; H. E. Babcock, editor of TELEPHONY, and members of the Chicago press. The receiving operator at this station was William H. Ocker.

At 3:52 the first message was flashed from St. Louis to Chicago. It was from the jury and said: "Regards to Hammer and Kelsey." It was repeated back to St. Louis by long-distance telephone, where it was verified. This was done in the case of each message. In several instances words were purposely omitted from messages at the St. Louis end to see if the omission would be noted by the Chicago receiver. In each case the ruse was immediately detected and St. Louis notified. A number of other severe tests were successfully made and then came the most important of all. Professor Hammer before leaving St. Louis had written a message in duplicate. He sealed one copy and left it there, retaining the other. He telephoned to St. Louis, asking that the copy there be opened and transmitted by wireless. After some delay the message came. As received it read:

Hammer, Chicago.—The names of Faraday, Hertz, Branley, Popoff, Lodge, Muirhead, Marconi, Tesla, Edison, De Forest, Dolbear, Braun, Fessenden, Slaby, Arco, Rochefort and Shoemaker are among those names connected with the principles and application of wireless telegraphy.

"I wrote 'indissolubly connected,'" said Professor Hammer. There was some lively telephoning to St. Louis, which disclosed that members of the jury there had cut out the word "indissolubly" in the message to see if the receivers would notice the difference.

The jurors and all those connected in any way with this series of tests expressed themselves as more than satisfied with the results obtained, there being not the least hitch in the proceedings from start to finish.

In addition to the test messages, aerograms (to be forwarded) were sent by President White to Hon. Paul Morton, Secretary of the Navy, and to Gen. A. W. Greeley, chief signal officer U. S. navy, both of Washington, D. C.; Prof. W. E. Goldsborough to the Chicago press, announcing that "the jurors report every message sent from St. Louis has been received with perfect accuracy;" Mayor Wells and St. Louis city council to Mayor Carter Harrison, Chicago, sending greetings from the new to the old world's fair city. Then, in addition, nearly a score of commercial messages were sent to be forwarded to persons in different parts of the country.

Since these tests sending apparatus has been installed in the Chicago station and the line has been in daily operation. The downtown Chicago station is in the new Railway Exchange building, which has been fitted out with apparatus complete.

An almost perfect system of syntonizing has been invented by Dr. De Forest, the inventor of the transmitting apparatus, which requires that the sending and receiving stations be perfectly attuned before intelligible information can be transmitted from one instrument to another. This is accomplished by eliminating static, electrical and atmospheric disturbances, which are continually attacking the currents shot from the transmitter. When two instruments become perfectly attuned, all elements become nullified. Their attacks are impotent, and the sound flies for its affinity, which, it is claimed, it reaches, providing the sending apparatus is strong enough to project it the required distance.

In its flight all substance is as powerless as the air to resist its progress. Tall, steel-ribbed buildings, it has been proven, are as nothing in the path of the electrical currents. It is not known what course the currents take, whether they bob over or execute flank movements to evade obstructions, but it gets to the receiving station, nevertheless, just as quickly as if it were being sent over a broad expanse of prairie land. Walls of solid steel, it is claimed, cannot bar a message from the station perfectly attuned.

The sending of messages from St. Louis to Chicago and return is the greatest feat yet accomplished in overland wireless communication. Besides demonstrating that messages can be sent for long distances overland, it has been also demonstrated that information being sent from a station to a particular point cannot be taken at another point unless the key is given from the sending station.

At present ten stations have been established on the World's Fair grounds in St. Louis. Fifty stations are now in working order along the Atlantic coast, and shortly, it is claimed, messages will be transmitted simultaneously from the World's Fair tower to all of them. Buffalo and Cleveland have been equipped, and Sedalia and Kansas City, Missouri, are in readiness to operate. Springfield, Illinois, has been getting its World's Fair news from the grounds for the past several weeks. A station is in course of erection in Alaska and Seattle, which will communicate with stations in the Sandwich Islands and the Philippines. The latter has been erected, and is ready for the test.

TELEPHONIC ISOLATION.

ONCE upon a time, not so very long ago, when Independent exchanges first began, there was a very general recognition on the part of the people that something had occurred which was inclined to benefit them. The rates were lower; the number of subscribers who might be reached was greatly enlarged; the attention and civility of the new group of servants was in many cases strikingly of a higher grade than that to which the people had become accustomed. But so far as communication between the people of one city and those in another was concerned, the cities of the earlier Independent exchanges were relatively isolated, and a great advantage was claimed by the original monopolists because of their more or less extensive network of long distance lines.

But the advantage of intercommunication between cities, towns and villages by long distance telephone lines, did not continuously remain with the Bell company. Some such isolation as was suffered by the early Independent subscriber, is now suffered by the Bell subscriber in a town having no Independent exchange, however great may be the saturation of the Bell system in that locality. Several of the largest cities in the United States have little or no Independent development within them. In such instances, the territory immediately around these cities, and from which in a large degree they draw their strength, is developed in a high Independent degree.

It is now the city without the Independent exchange which is isolated, and its condition of being on an island, cut off from communication with the active and wealthy mainland, is becoming more serious. It is conceivable that all the large cities of this kind must ultimately be provided with strong and active Independent exchanges, if by reason of no other cause than the demand coming from outside. New York, Chicago, San Francisco, Cincinnati, Omaha, must be provided with Independent exchanges in order that merchants and manufacturers of those communities may get into relatively as good communication with their country neighbors as they were before the advent of Independent telephony.

BRITISH TELEPHONE STATISTICS.

THAT our English cousins are quite as talkative, from a telephonic standpoint, as are we of Uncle Sam's domain is forcibly evidenced by the report which has just been issued by the Postmaster General of Great Britain bearing upon the relative use of the telephone and the telegraph in England. The showing, by the way (as was the case in the United States in the recent telephone report), was greatly in favor of the telephone, which industry came forward with a marked gain over the telegraph, though it has been in existence less than half as long.

The report was for the year ending March 31, 1904, and showed that the telegraph receipts continue to suffer from the growing use of the telephone. The falling off in the number of telegrams last year was 2,500,000. The total number of trunk line conversations during the year was 13,467,975. The corresponding number for the preceding year was 11,574,229, and the increase was thus 1,893,736, which is 16.3 per cent. The gross revenue from this service was £325,525, as compared with £274,835, the increase being 18.4 per cent. The average value of each conversation was 5.8d. Seven years ago the average value was 5.02d. This increase is due to the growing use of the trunk lines between more distant towns.

The number of telephones in connection with the London postoffice telephone system increased during the year from 9,122 to 15,632, and additional subscribers are being connected at the rate of from 100 to 200 a week. The length of underground pipes laid in the London area to March 31, was 1,146 miles, and cables containing 125,717 miles of wire have been drawn in. This includes 32,248 miles for the use of the National Telephone Company. The present subscribers and the junction lines between exchanges have absorbed 43,335 miles; and 50,134 miles remain available for the further development of the service. On an average each circuit directly connected with an exchange needs a mile and a half of double wire, if allowance be made for the junction lines between exchanges. This is an increase on the average length mentioned in the last report (1.35 mile), the addition being principally due to the increased distance of subscribers' premises from the central offices.

The average cost of construction has increased since the last report from £18 11s. 4d. per mile of double wire to £18 16s. 10d. The capital outlay per line has risen from £38 6s. 3d. to £41 9s. 8d. This does not include the charges for spare wires, or for the ducts, cables, and exchange plant intended to provide for the future development of the system and not yet brought into use.

An account of the receipts and expenditure relating to the London service for the year ending March 31, 1904, shows a balance of £33,515 available for meeting the charge for interest on capital and depreciation. The capital expenditure to March 31 was £1,514,300. A large part of the plant has not yet been brought into use, and is, of course, earning no revenue. This happens in all cases where large underground systems are provided to meet future requirements, but the great size of the London system makes it more noticeable in the metropolis than elsewhere. The report remarks that the proportion of revenue available, after paying working expenses, for the payment of interest on capital and for erecting a sinking fund will increase each year.

A serious feature of this showing is an actual falling off of telegraphic messages in Great Britain during 1903 of nearly 3 per cent from the previous year. It may be assumed that in all countries the telegraphic service has become stationary, if not actually on the decline, the telephone having superseded it for all local and short distance service.

While Great Britain leads the United States by a slight margin in the matter of telegraphic messages sent during the year this country is far in advance in the use of the telephone—in fact, it leads the world. Recent statistics published by the census department developed the surprising fact that during the year 1902 more than five billions of telephone conversations were exchanged in the United States, and this figure by no means approaches what statistics will show for 1903 and 1904, as the development of the telephone industry in the last two years has been something enormous—almost beyond belief. And the same may be said of Great Britain.

A study of the postmaster general's report is interesting, as is the study of all telephone statistics. The figures show to what gigantic proportions the telephone industry has grown in Great Britain, and give promise of an even more brilliant future for this wonderful business, which is still in its infancy. And what is true of Great Britain applies with still greater force to the United States, where the progress of the Independent movement has amazed telephone men in every land.

Th popularity of the telephone service needs no explanation. It requires no expert operators, trained to read and translate a series of signals, and no messenger delivery service. Those who use it converse in the ordinary tone of voice and are not limited in the use or choice of words. A five-minute talk over the telephone will cover the details of a business, domestic or social transaction much more satisfactorily than a ten-word message. In consequence, within the range of ordinary telephone conversation the telegraph has been already displaced. The extension of telephone service into the rural districts, whereby every isolated farmer may become all the world's next-door neighbor is rapidly taking place, so that there is no future for telegraphic expansion in this direction.

RURAL TELEPHONE ADVANTAGES.

ONE of the most progressive moves that has ever been made in this or any other country, having for its purpose the benefiting of rural communities, is the installation of telephone communication therewith, which is rapidly going on in every direction. Though already a great movement in itself it may truthfully be said that the work of establishing telephone systems in country districts has but just begun.

In city life the telephone has long been accepted as an essential, but it is finding an even larger field of usefulness in the rural communities. It annihilates space by bringing far-separated districts, as miles are measured, into speaking distance and affords farmers the same facilities for securing information that are accorded the business men of any city, whose special mission it may be to keep in close and constant touch with the markets. The telephone, more than any other one thing, has, to a great extent, driven lonesomeness away from country homes and has made farming more attractive and more profitable.

There is no end of uses to which the farm telephone may be put, and that to good advantage. Not the least of these is in hunting down horse thieves and others of that ilk. When a farmer has a telephone and has suffered from robbery he is able to immediately notify his neighbors, the constables and the police, and the electrical communication no doubt has a tendency to encourage belief in honesty.

But these are not the only inducements. Many of these systems cost the individual subscribers only about two dollars a year, and they save the money fifty times over. They are severely practical. Mrs. Jones happens to think she wants something from town, and instead of asking the husband or one of the sons to take the time from the field, she rings up the merchant and tells him to send along such goods in the care of the rural mail carrier. The farmer desires to notify the men who are to help him thresh his grain; he calls up central, gives her the list and saves himself half a day or a whole day that would have been spent riding about the neighborhood. The farmer has some idea of coming to town, and naturally has the desire to bring along a load of

merchandise from the farm. His daily paper gives the quotations, but he is able to call up the market and post himself as to supply and demand in various lines. As a consequence he brings the thing that the market needs most, makes a quick sale, secures better profit and saves time. He does not now need to spend an entire day selling a load of produce, and by using his telephone and his market quotations is able to sell to the best advantage. That is what makes the operation of any property profitable.

Then there are a thousand and one little conveniences of business, society, church work and other lines of effort for the various members of the family, and really it might be a matter of convenience to John, aged 20, to know whether Hannah, aged 18, and living on a farm four miles away, would be disposed to go for an airing if he should go to the trouble to hitch up to the clash-top.

Looked at from any point of view the telephone is an advantage to those living in the rural districts. Its value cannot be estimated in dollars and cents. It places city and country in immediate communication, rendering unnecessary four-fifths of the trips that have hitherto been made on country roads. Highways may be muddy and weather stormy, but the world can be rung up according to the necessities of the moment, facilitating business and social life, and saving an immense amount of time and effort.

A marked tendency of the age is to bring the country into closer touch with the centers of population. Electric roads are multiplying and make their way into neighborhoods that could not hope for steam lines. Rural free delivery of the mails is moving onward with great strides. Over 20,000 routes are in operation. Farmers get their letters and the daily news delivered almost at their doors. Each day's events reach the country promptly and the old rural isolation is disappearing. Means of ready travel grow better and keep on extending, and the good roads organizations gain constantly in active support.

Within a dozen years electric transit in the cities has more than doubled the area suitable for town residences. Cities themselves are spreading farther into the country, of which suburban sections are a pleasing modification. Labor on the farm has been rendered easier by ingenious machinery. All whose memories stretch back to pioneer days can bear witness to the enormous advance toward bringing country and city together. Progress in that respect proceeds at an accelerated pace. Going to the city or taking a run into the country is a commonplace incident. How far the space between will eventually be annihilated is beyond the range of conjecture, but the old lines of separation are disappearing in so many ways that the future relations of country and city are full of hopeful interest. And in bringing this happy state of affairs about the telephone has aided fully as much as any other one agency.

Then there is a reflex side to the drift of the population to the cities. Love of country life is a natural and general feeling. The merchant who comes to the city as a youth to make his fortune often returns to the country when he retires, and dreams of doing it all through his busy career. He would hardly be willing to admit the deep tenderness of the memories of the old farm. All the remoteness of that quiet nook has passed away. You can "ring up" the farmer of to-day and find that he is abreast with the current news and that he has it in printed detail, thanks to the rural delivery carrier. Americans are the best farmers in the world, have the best appliances for their business and pursue it with the highest degree of intelligence and enterprise. The cities are reaching for them and they are reaching for the cities, and the prospect is full of agreeable possibilities.

The telephone annihilates distance and is hardly less swift than thought itself. It is the magic medium that rides on the wings of the lightning and showers its blessings on poor and rich alike.

TELEPHONES ON TROLLEY CARS.

IT was only a few years ago that the person who predicted that in a few years you could go to a telephone in New York and talk with a person in Chicago was scoffed at—almost put down as a lunatic. Yet such a thing came to pass. It will be only a few years when people in San Francisco will be able to telephone to New York. There is no limit to human ingenuity.

Only a few days ago the announcement was made that telephones have been placed in the trolley cars running out of Pittsburg, and passengers, while they are being whirled through meadows, pastures and corn fields, can talk with their business associates and friends in Pittsburg and the adjacent cities.

This is only one of the many similar inventions that are being consummated from day to day. Advancement in the telephone has kept pace with the advancement made in electricity and in ten years there will be more great inventions and while they may seem impossible now, will be comparatively easy to the modern inventor who keeps pace with the times.

THE MACHINE IN THE TELEPHONE BUSINESS.

WHEN we do not stop to think, we usually condemn the machine in politics. When we do stop to think we are apt to retract a little, and to conclude that after all it is probably the result which ought to be condemned rather than the means of reaching it. The machine is only another name for a very effective organization, in which, at its highest development, the co-operation and co-ordination of parts is highly admirable, and in which everything is subordinated to "getting the thing done." Loyalty to the issue; great determination; alertness in perceiving conditions; celerity in acting upon them; dexterity in diplomacy; assurance and foresight—these are the causes that make the machine the successful thing it is. Can you pick out one of these elements of success that does not fit the telephone business?

The machine in politics has two tasks before it: First, and always, to beat the other crowd, and second, to please the party; and incidentally, if possible, to please some part of the public lying outside of the party. In Independent telephony, it has not been found a great task to start with nothing and soon to gain substantial advantage over the enemy. This has come about pretty largely through the ability of the operating company to please the people in many ways, and the public's ready response to a little pleasing has furnished the proper reward—that of success, and an earnest of what the future might hold.

If all the advantage which has been gained is to be kept and more built upon it, the operating companies must co-operate more and more closely in order that intercommunication between exchanges may be simplified and expedited as to routing, timing and prompt clearing of troubles.

REJECTED FORTUNES.

Professor Bell had a strenuous time over his invention of the telephone. He took the first working model of his instrument to John A. Logan and offered him a half interest for $2,500, saying that it would do away with the telegraph and that there would be millions in it. Logan replied: "I dare say your machine works perfectly, but who would want to talk through such a thing as that, anyway? I advise you to save your money, young man." Bell then offered a tenth interest to an examiner in the patent office for $100 in cash. It was refused. That tenth interest was worth $1,500,000 in fifteen years.

Concerning Telephone Lines

SAMUEL G. McMEEN.

ELECTROLYSIS OF UNDERGROUND CABLES.

THOSE who are familiar with the earlier history of telephone practice, and those who are not who have read the first article of this series which appeared in the May issue, will recall that all telephone lines were single wire circuits in the beginning of practical telephone development, and for a number of years thereafter. It was the advent of electric light and electric street car systems, particularly the latter, which made grounded circuits unsuitable for the best telephone service. The existence of high tension arc light circuits made these single wire telephone circuits noisy while the former were in operation. The existence of electric street railway systems not only made the telephone lines noisy, but caused false signals upon them, the annunciators of the subscribers' lines being frequently dropped by stray currents flowing over the lines. As the street car systems became more extensive in the cities, and particularly as their traffic grew heavier, the difficulties from these two troubles became quite serious. No remedy was discovered to be reasonably possible so far as changing the street car system was concerned, except to provide each car line with two trolley wires, and each car with two trolley poles, making the street car system wholly metallic circuit, the rails not being used at all for the return of the current to the power station. Such systems have been installed abroad, and such was the plan adopted in Cincinnati, Ohio. In that city, grounded lines were successful operated for a considerable time after the establishment of the electric traction system. So long as the car truck and wheels were kept insulated from the electric circuit of the motors, the telephone lines passing or ending near the trolley line were free from disturbances. If by any defect in the car a cross occurred between some part of the motor circuit and the truck, the progress of that car through the streets could be traced by one listening upon the telephone lines, and it was by means of this detective work of the telephone system that such defective cars were located, their numbers ascertained by having a subscriber look out of the window to observe the passing of the noisy car, enabling it to be withdrawn from service and repaired. The double trolley system with its distinct freedom from being the cause of trouble is still extensively in service in Cincinnati.

The existence of so thoroughly possible a traction system with its absence from disturbances to the telephone system, caused legal action to be instituted in Ohio, wherein it was contended by the telephone company that as the traction interests possessed a means of operating their cars without interfering with the telephone system, the former should apply that method, or be compelled to continue it if they had applied it. The decision of the lower courts was favorable to this contention, and it seemed at that time as if the single-trolley rail-return traction system must disappear. In the higher courts this decision was reversed, it being held that the telephone company did not possess such a right to the use of the streets and the earth under the street, as to permit it to interfere with the proper use of the streets for transit and transportation. The ruling in effect was that the telephone company did not own the earth, as some phases of the attitude of the original monopolists has indicated they were inclined to believe. From this time the growth of single trolley traction systems continued without further opposition from the telephone interests, and the burden of relief lay upon the latter.

One of the measures of relief was that devised by McCluer of Richmond, Virginia, and consisted in the simple expedient of providing for each main and branch route of the telephone system, a copper return wire to which the telephones of that district were connected, instead of being connected to ground. For a given route of 100 lines, for example, there would be 100 line wires, plus one common return wire. The office of this was merely to provide a return path to the central office quite as the ground had provided such a path before, and its success depended upon its being kept clear of ground. In a sense, an exchange having single wire lines, and a common return wire on each route, the other returns being united in the central office, might be called a metallic circuit system, because if the circuit is not grounded in any degree it must necessarily be metallic. In the accepted sense, however, a system utilizing a common return is only to be called metallic circuit by an excess of courtesy, because it partakes in a large degree of the disadvantages of a grounded system. The chief disadvantage is the lack of similarity in the two sides of the line, one side being its actual line wire, and the other the common return. As the latter has many lines connected to it, and as it is usually of copper and the line wire frequently of steel or of iron, the conductivity and electrostatic capacity of the two sides of a given line were distinctly unlike. The common return wire did, however, successfully cure the trouble due to the falling of drops from stray traction currents. These troubles, as they were due wholly to currents flowing between separated points of the earth, would no longer exist when the use of the earth as a return had been abandoned.

Following this partial cure of the new difficulties, the existence of metallic circuit long-distance lines assisted in introducing the present general practice of making all subscribers' lines of two wires, with the consequent advantages of complete balance, complete quietness, and absence from false signals. This made it further advantageous to combine many lines in one cable, even though it might be of considerable length, because the complete balance of the subscriber's metallic circuit rendered it free from cross talk troubles, as well as from inductive noises. When it became possible to place many wires in one cable, it was further possible to place the cables underground, and such practice became general.

In 1895, I. H. Farnham, chief engineer of the New England Telephone Company, observed the beginning of an epidemic of underground cable troubles. In all of these new troubles, the difficulty was a failure of the underground cable due to loss of insulation. The loss of insulation was found to be due to the entrance of moisture, and this to an unaccountable appearance of holes in the lead sheath. With characteristic thoroughness, Mr. Farnham investigated all the elements accompanying this new trouble, and conducted a series of experiments which led him finally to discover its cause. This was the eating away of the lead sheath of the underground cable at a certain point, or at certain points, in its length, and this destruction of the sheath was due to the passage of current from the sheath to the earth in the presence of moisture.

The corrosion of a lead sheath by currents passing from it to the earth must not be confused with any electrical use of the conductors of the cable, as it is entirely independent of such actions. The reasons the lead sheath is attacked at all are several: First, the existence of a single trolley traction system, using the rails of the track as a return for current, does more than that statement implies. Whatever may be the condition of the soil in any city, the rails laid upon the earth will be assisted, in carrying current, by

the earth's mass itself. This is true, however well the rails may be supplemented by copper return wires connected to them at intervals. Second, the cable sheaths themselves, being formed of lead, a fairly good conductor, in a considerable amount, and laid in quite good contact with the earth itself, necessarily assist the rails and the rail-return in carrying current toward the power station. Perhaps this is as well told by saying in any traction system, an examination of the territory covered will show that different points in the territory have different potentials with relation to the earth at the power station; and it is obvious that where differences of potential exist, and these are connected to each other by a conductor, current will flow. The amount of current which will flow is an immediate result of the amount of the difference of potential and of the conductivity of the connecting conductor, which in this case is the cable sheath. It is further evident that the difference of potential depends largely on the number of cars which are in use at a given time, upon their location, and upon the amount of current they are drawing from the power station.

The destruction of the cable sheath, it has been said, takes place at the point where the current *leaves* the sheath to enter the earth. It is not true that any destruction takes place at any point where the current *enters* the cable sheath. It is true that these statements may be considered loose, in view of the fact that we do not really know that current does flow in one direction rather than another, or that it flows in any direction at all over a conductor; but in the usual acceptation of such ideas, current is presumed to flow from a positive to a negative potential. These potentials are known by the terms, positive and negative. It is equivalent, and perhaps more accurate to say that the destruction of the cable sheath takes place where current flows between a positive condition of the cable sheath, and a negative condition of the surrounding earth.

The result of current under such conditions is quite the same as takes place in an ordinary electrotyping or electroplate bath. In such a case, the metal which is to be dissolved is connected to the positive pole of a source of current, and the thing which is to be plated upon to the negative pole. It results that the metal taken from the positive pole is passed through the solution and deposited upon the thing plated. In the corrosion of cable sheaths, the lead taken from the sheath may not be deposited upon a particular thing, but it is dissolved from the sheath if only the condition of moisture exists. In almost all underground situations, moisture is present, and in addition has dissolved in it salts or acids of various kinds, which assist in the electrolytic processes. A simple experiment of passing current from a piece of lead through moist earth to another conductor will establish the certainty of pitting the lead, while no effect whatever results when the current is passed from a conductor through the moist earth to the lead.

Some idea of the conditions to which an underground cable is subjected may be gained from Fig. 1, in which it is assumed that, as is usual, the negative pole of the power station generator is connected to the rail and therefore to the earth, the positive pole to the trolley wire, and that the telephone cable passes through the territory in such a way that one part of it is nearer the power station than the other. Indeed, it is not essential that even this condition exists, because, due to the existence of other pipes, and to natural conditions of the earth, a cable may be laid in such a way as to be always equally distant from the power station, and yet to be subjected to the carrying of return current, because it passes through regions having different potentials with relation to the power station, and therefore to each other. It is evident that in a condition such as is shown in Fig. 1, no destruction of the cable sheath would take place at the point where current enters, near the ends of the portion shown, but that its sheath would be attacked in a greater or less degree at a point nearer the power station, where the current is indicated as leaving the sheath.

An idea of the relative conditions of this destruction may be gained from the statement that a few volts difference of potential between two points of the cable sheath will cause a large current to flow therein, the resistance of the sheath being so very low. The destruction at the point where the current leaves it, can be accomplished with a difference of potential between the sheath and the surrounding earth of less than one volt. In many cities there are differences of potential between different parts of the city, of as high as twenty volts.

As it has been accepted that single trolley systems may be used, and differences of potential between points in cities must be expected, the prevention of cable sheath damage must evidently come from work done upon the cable system itself. If the cable sheaths could be of some non-conducting material; or if the cables could be carried in dry and non-conducting underground pipes; or if the current entering the cables might be carried by their sheaths and caused to leave at a point where there was no moisture contact; or if some easily renewable metallic mass could be attached to the cable at each point where it has had a tendency to be destroyed, the problem might be considered solved. It has not been found possible at all as yet to inclose the cable wires in anything but a metal sheath; but it has been found reasonably feasible to occasionally insert insulating joints in the cable sheaths, which, while they seal the core satisfactorily, interrupt the continuity of

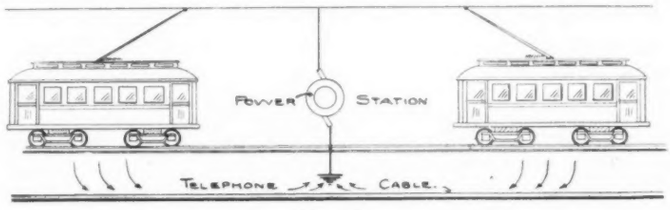

FIG. 1.

the metal sheath. This remedy is comparatively a recent one, and if it could be produced with practical certainty as to the tightness of the joints, should result in at least a very considerable reduction of electrolytic hazard. It will easily be seen that this is so, because in practically all situations, the greater potential difference between earth points exists between the points further apart, and the cable which is most likely to suffer from electrolysis is a long one. If a long cable be subdivided by insulating joints, the current which flows in it will be much reduced, and therefore the liability of destruction at the points where current leaves will be made much less.

To enclose cables having continuous metal sheaths in wholly dry and insulating conduits has been the fond dream of manufacturers and constructors, but so far as proof has been given it is yet unrealized. Conduit material of paper or other fiber, saturated with asphaltic or bituminous compounds may be presumed to be of better insulating character than clay conduit material; but when in the earth, exposed at manholes, it has not been shown that a conduit system of this kind really and completely protects the cables from electrolytic damage.

To permit the cable sheaths to take up such current as they may, and to carry it away over an actual metallic connection at a point where it would otherwise pass to moist earth, is a wholly satisfactory remedy, and if conscientiously applied and kept applied, will protect any network of underground cables. The difficulty of this application lies in the fact that after the location of the danger point has been discovered, and heavy copper wires attached to the cables, and to a return to the power station, the mere addition of these bonds and the possible future change in the traffic of the street car system, may introduce other danger points which did not exist before. To bond the danger points to the power station return, however, is the present general curative practice.

To attach to the cable sheaths at danger points some metal intended to be destroyed, is a precaution which is a practical one, with the simple objection that such an attached mass will itself be destroyed in time and will require replacing. The ideal cure is, of course, one which is applied once for all.

In order that the danger points may be determined, it is simplest to utilize the telephone lines themselves for that purpose. Establishing a ground at the central office for the fundamental point of comparison, a sensitive voltmeter is to be connected to a wire of each of the subscriber's lines, in succession, while an assistant on the line temporarily attaches a ground. The voltmeter will then read the difference in potential and the direction of that difference between the central office and the outlying ground, the result of which should be noted on a map. When many such observations have been made, all the points having smaller potentials may be connected together by lines, and from that map may be determined what is likely to happen to any cable whose length and location are laid out upon it. The danger points having been observed, a plan of action as to the introduction of insulating points, the bonding of the sheaths to the power station return, or the application of a buried mass of metal bonded to the sheaths, may be selected.

Upon the completion of the cures, voltmeter measurements must be made between the cable sheaths and their surroundings, to see if the desired condition of neutrality has been reached. Any cable may be said to be out of danger at a given point when that point has in even a small degree a negative condition to its surroundings; and if in repeated observations which are made from time to time, a point previously negative is shown to be growing less so, or has reached a positive condition, further bonding or other remedy must be applied.

A "TELEPHONE PICNIC."

That the telephone has a great influence on the social relations of a community has often been asserted, but positive proof of this was given not long ago when the farmers of Hillsdale county, Michigan, held a "telephone picnic." Hillsdale county is the home of many prosperous farmers, who have lived for years in the same locality, but who, up to a few months ago, did not and could not hold very close intercourse with any but their nearest neighbors. The only means by which a neighborly call could be made was to hitch up the family horse and drive one, five, or, perhaps, even ten miles, and return. Naturally, the number of such calls was very small and the people never enjoyed an intimacy such as now exists. The recent change is due to the building of farm telephone lines, and today almost every home in northeastern Hillsdale county has a telephone and can get connection with hundreds of other homes in the immediate vicinity, and in the entire southern portion of Michigan and northern Indiana. The first lines were built a little more than eighteen months ago, and since then there has been a steady increase, so that now there are over 2,000 telephones in the county.

During the summer of 1903, when the telephones had been in service only a few months, the subscribers got together and planned a picnic. As most of the telephones used by these subscribers were Monarch instruments, manufactured by the Monarch Telephone Manufacturing Company of Chicago, they decided to call the gathering the "Monarch telephone picnic." The affair was such a great success that it was decided to repeat it this year. Therefore, not only the attendants of the first picnic, but all the telephone subscribers for miles around entered heartily into the plan and made arrangements for a jolly, sociable time on September 3 in a pretty grove centrally located. Invitations were sent to several hundred persons and as a special compliment one was mailed to the Monarch Telephone Manufacturing Company. Owing to a particularly busy season the company could not be represented in person, but devised a means of making itself remembered by all those in attendance. A four-bar 1,600 ohm compact type bridging telephone was sent by express, prepaid, to the secretary of the picnic, together with 500 raffle tickets. The tickets were arranged with stubs and were numbered in duplicate from one to 500. Explicit instructions were printed on each, so that in the afternoon, when all the tickets were collected for a drawing, each person had a stub to identify his ticket in case his was the lucky number. Amid great excitement and friendly bantering, the numbers were placed in a hat and the drawing made. The lucky number was 343 and the fortunate possessor of the corresponding stub was E. B. Straight. Mr. Straight was immediately the center of attraction and received the hearty congratulations of his less fortunate neighbors.

A letter of thanks was sent to the Monarch company by the secretary of the picnic for introducing such an interesting feature in the day's enjoyment. The gathering broke up at sundown and it was unanimously decided to hold a third annual picnic in 1905. Such occasions as the one just held tend to make country life more enjoyable, as it makes new friendships possible and creates new social relations. These conditions can be maintained through the use of the farm line telephones. The winter evening talks over the telephone will undoubtedly contain many pleasant references to the second annual telephone picnic of the rural subscribers on the Independent lines of Hillsdale county.

UNDERGROUND CONSTRUCTION.

The Mutual Telephone Company of Des Moines, Iowa, has adopted rules by which the practice of running overhead cables and wires into buildings in the business district will be done away with as rapidly as possible. Instead all wires will be taken in from the conduits underground.

The Carthage (Mo.) Home Telephone Company is placing some of its wires underground.

A telephone conduit system will be built at Paducah, Kentucky.

Work has been commenced on the telephone conduit system at Waterloo, Iowa.

The city council at Newport, Kentucky, has ordered the local telephone company to place all its wires underground.

The city council of La Porte, Indiana, has granted the La Porte Telephone Company permission to lay an underground cable in certain portions of the city.

An ordinance has been introduced into the city council at Springfield, Illinois, requiring underground construction for telephone and other electric wires.

The Citizens' Telephone Company of Covington, Kentucky, has obtained permission to build conduit and lay its wires in the business section underground. Work will be commenced at once.

The Schooler Brothers' Telephone Company will begin the construction of a new telephone system in South McAlester, Indian Territory, in the near future. The system will cost $50,000, and will be built on the conduit underground system.

The Chicago city council has declared war on the Chicago Telephone Company (Bell). Alderman Blake, acting chairman of the committee on gas, oil and electric lights, at a recent meeting presented a resolution which was passed by the council and will be considered after vacation in October. The most important clause in the resolution is as follows: "Investigate the rates charged by the Chicago Telephone Company and submit an ordinance fixing just and reasonable rates, the price of which is not now regulated by the ordinance of January 4, 1889, or any other ordinance."

Telephone Problem in Large Cities

FRANZ J. DOMMERQUE

The present hour confronts the telephone engineer with the problem to find adequate and economical ways and means to provide proper telephone service for many large cities, where the number of telephone users has increased enormously in late years, caused by a better appreciation of the usefulness and convenience of the telephone and the decreased cost of telephone service. In the last decade the population itself has shifted under the expansion of rapid transit; on the one hand business men congregating in huge office buildings, on the other hand the residential districts radiating far out into the country. These altered conditions must be taken into consideration in the arrangement of new switching apparatus, to replace old equipment, now inadequate, obsolete and worn out.

When speaking of large cities, it would be drawing the limits too close to consider only New York and Chicago and the capitals of the old world. All cities with more than 100,000 inhabitants should be included, and in fact all that will be said for cities of 100,000 pertains equally well to cities of smaller population as long as they can be termed cities at all.

Telephone service must be reliable in all cases: it also must be quick and not involve any operation on the part of the subscriber. The cost of service must be reasonable; the business man can and will pay a greater amount for good service than the residence subscriber, but there should be no difficulty in arranging rates satisfactory to the latter by a judicious use of party lines and measured service.

It has been the general rule up to the present time to divide a large city into a number of districts; to locate a central office in each district and to connect these offices by trunk lines. When economy only is taken into consideration, this method of handling the telephone business is probably correct, as in large cities the actual minimum of annual expenditure will be obtained with more than one office district, because the expense for the wire plant, which is the principal item of annual expense, decreases with increasing number of office districts, while the other items that contribute to the annual expense increase up to a certain point where the sum of all items gives a true minimum.

Paying, however, due respect to the quality of service, it is a plain fact that with the introduction of trunking the service must become less efficient, because, to begin with, it takes more time to put through a trunk call than a local call. As all trunk calls must be handled by at least two operators, a greater liability to human errors is introduced; trunking also increases the apparatus and cable in the office, tending thereby to deteriorate the quality of transmission; and, finally, no matter how good the discipline of the operating-room may be, it generally happens that in the busiest hours of the day when the service should be most rapid, all the trunk lines are in use and subscribers are forced to wait for connections. The trunking troubles are still more aggravated by the necessary evil of order wires. It is a wonder how in large cities where the percentage of trunking is very high, the operators are at all able in the busy hour to distinguish between orders. Anyone who ever listened in on an order-wire circuit in a busy exchange will be convinced of the difficulties in that respect.

If, therefore, money was no object, the ideal way of giving telephone service would be to bring all subscribers' lines into one switchboard. Looking at the problem from a physical standpoint, there is a limit to the size of the switchboard. To begin with, it may be conceded that as a result of many years' experience the multiple form of switchboard has shown itself as most adapted to satisfactory service. As a multiple board demands all subscribers to be in reach of every operator, it is absolutely necessary to decrease the size of the multiple jacks with increasing number of subscribers. The greatest number of lines that can be accommodated in a multiple section with the smallest jacks at present in commercial service (jacks with 3/10-in. centers) is 20,000 in an *A* section (a section upon which only local and outgoing trunk work is done), and 25,000 in a *B* section (a section used for incoming trunk work only). The capacity of a *B* section is greater on account of the gain in space by the absence of the answering jacks and signals and outgoing trunk jacks. However, 20,000 lines do not necessarily mean 20,000 subscribers, since by the aid of party lines and private branch exchanges the number of subscribers may be greatly increased. Party lines being mostly used in residence districts, where the lines are of considerable length, effect a great saving in line expense and consequently permit of lower rates, which circumstance increases the number of residence subscribers; party-line service naturally tends to increase the size of an office district.

Assuming that the use of telephones would become so general that one telephone would be required for every five people, and assuming furthermore that one-half of the telephone equipment would be used for a single-line service, and the other half for party lines and private branch exchanges; and that the party-line and private branch exchange subscribers would require only one-third as many lines as the other subscribers—in other words that three times as many party-line and private branch exchange subscribers could be accommodated as there is line equipment in the switchboard—then with a board having a capacity of 20,000 multiple jacks, 10,000 single-line subscribers and 30,000 party-line and private branch exchange subscribers, or a total of 40,000 subscribers could be given service without necessitating the use of more than one office. According to the above assumption, this would correspond to cities with not more than 200,000 inhabitants, or better expressed, all cities that will not increase to more than 200,000 inhabitants during the life of the switchboard.

There exists the possibility of extending the use of a single office to a larger city than of 200,000 population by the aid of so-called "division systems," sometimes termed group systems. Such systems subdivide a multiple board into two or more divisions so that only one-half or one-third or one-fourth the number of lines (according to the number of divisions) are multipled in each division, while each division contains answering jacks and signals for all the lines. A two-division board thus would contain 20,000 multiple jacks of the 3/10 inch type in each section of each division, giving a total of 40,000 lines. There would have to be a total of 80,000 answering jacks and signals, as each line would have to appear in each of the two divisions. This doubling of answering jacks and signals, however, does not mean doubling of space, as in a two-division system the an-

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swering jacks can be spaced close together (20 per strip). while in a straight multiple board they are spaced ten per strip for good service; because in a two-division board there are twice as many jacks for the same number of originating calls as in a straight multiple system.

Seven years' experience with division boards has established the fact that more than two divisions will not give both good and economical service: four divisions can give *good* service, but the service is not *economical,* principally on account of the practical impossibility of using an intermediate distributing board, since the cross-connecting wires become unwieldly; hence, the possibility of distributing the load evenly over the operators, or rather the possibility of loading each and every operator to the limit is excluded. With two divisions, the use of an intermediate distributing board is practical, as not more than a three-pair cross-connecting wire is required. Therefore, with a two-division system, 20,000 single line and 60,000 party line and private branch exchange subscribers can be accommodated on 40,000 lines in the switchboard, whence the use of a single exchange may be extended to cities with a population of 400,000.

Many telephone engineers are unfavorably disposed toward anything that involves labor on the part of the subscriber, and in a two-division system the subscriber would have to press one of two buttons upon his instrument, according to the division upon which the desired subscriber is located; and this operation, though involving only a minimum of attention on the part of the subscriber, is not quite as simple as just lifting the receiver off the hook to signal the operator. Where a two-division system would not find favor, the city must be divided into districts and trunk lines must be used. In such a case the number of districts should be kept small in order to keep the trunking in narrow limits. In fact, the trunking should be kept below 50 per cent —in other words, of all the originating calls, not more than one-half should be trunked. This can best be accomplished by establishing one office with a 20,000-line board in the center of the densest telephone population, then selecting clusters of less dense telephone population and providing each of them with an office and trunk between them. In this arrangement all boards would be multiple-boards, as there would be sufficient local business to require a multiple on the *A* sections. As soon as the district of *dense* telephone population becomes too great for one office, and must, therefore, be subdivided into more districts, the percentage of trunking will naturally rise; and from experience it is known that in New York and Chicago, for instance, the percentage of trunking exceeds 60 per cent and has been considerably higher at the time when the offices, or rather the switchboards, were smaller. When the percentage of trunking is high, the multiple in the *A* boards is not used much, and the question is raised if it would not be better under the circumstances to trunk all the calls so that the *A* board would be a receiving board only, while the *B* board would contain a large multiple. Doing this should offer an opportunity to simplify operation, as the *A* operator's circuit could be made very simple. Time also should be saved in the average duration of a call on account of simpler and more uniform manipulations; in other words, when all calls are trunked, it should take less time to put up a connection on a trunk line than where only part of the calls are trunked.

From the above considerations it follows that in an exchange without trunking, the best service can be rendered, and that the quality of service deteriorates with increasing percentage of trunking. It also is a fact that with large office districts the annual expense is greater than with small office districts. The question arises, which of the two —better service with greater expense or inferior service with minimum expense—should be selected; or is there a compromise?

Where competition exists, as is now the case in all large cities of the United States with the exception of New York and a very few others, that company which gives the best service is most apt to find the greatest favor with the public. Where the telephone service is in the hands of the government like in all principal European countries, the government certainly desires to give the best service if it only can raise the money. It seems, therefore, reasonable to say that the best service should be made the rule, and that every effort should be made to render this best service with the least expenditure.

The principal item of expense entering into this problem is the line expense. And reduction therein will be in favor of larger office districts, the term "district" being here relative, meaning a district containing a great number of subscribers and not necessarily covering a large area, though the larger the area the more marked the difference in expense will appear.

With large office districts more lines can be concentrated into heavy underground runs, which will reduce the relative cost of the conduit system. Larger cables can be used and larger cables are cheaper per conductor than small ones. The demand for larger cables has prompted the cable manufacturer to build cables with 400 and more pairs. Of course, the conductors in these cables have to be of a finer gauge than had previously been the custom; but the development in transmitter design kept pace with the progress in cable manufacture, so that these cables with finer wire do not deteriorate the transmission so long as the capacity is kept within reasonable limits. All these briefly mentioned items are in favor of large as against small office districts.

The introduction of party-line service in the residence district has made the proposition of large offices still more favorable. With small office districts the management often was doubtful whether party lines would really be money savers, because the parties as a rule were located so far apart that the common line from the exchange to the point or points of connection with the party lines, plus these party lines, did not cost much more than individual lines direct from the exchange to each of the parties; the saving in the line expense in that case did not seem to be in accordance with the decreased revenue per party line. With large office districts the common line from the exchange to the connecting points is most likely long in comparison to the party lines and, therefore, a real saving results.

On the other hand, improvements have been and are constantly being made in the design of trunk circuits, the principal step in advance being the introduction of automatic features, like automatic or machine ringing, which secure simpler operation and reduction of time, but necessarily involve complication in the apparatus.

In the Strowger automatic telephone system, now so largely exploited, trunking is carried on entirely automatically, the subscriber being made to perform what little is left of operating. This is a case of going to the other extreme, where all calls, as far as large exchanges are concerned, involve trunking, and where all the trunking is done automatically in the exchange with, at present, very complicated apparatus. It is not the purpose of this paper to enter into a discussion of automatic v. manual exchanges; it may only be assumed that the automatic exchange can be made practical and it may further be expressed as a personal opinion that the vertical and rotating movement as applied in the Strowger switch is the keynote of automatic working. With this in mind, the exchange problem in large cities becomes entirely different. The trunking no more affects the service and, therefore, the choice between large and small offices or office districts resolves itself into a problem of economy pure and simple. In this case the engineer must find the true minimum of annual expense and be guided thereby in the selection of the number and location of the offices.

The sum total of automatic apparatus will be the same whether all concentrated in one building or scattered over many. The length of the trunk lines, however, varies, being shortest with all the switches in one building and increases with the increasing number of and distances between offices.

The reverse is the case with the subscribers' lines, and there can be found a balance where, ceteris paribus, the expenditure on trunk lines plus the expenditure on subscribers' lines gives a minimum.

So far the term "service" has been used to designate the more or less satisfactory arrangement and working of the apparatus either by operators or automatically. Another phase of service is represented by the quality of the transmission of speech. Not much need be said in relation to this, as there are obtainable the most efficient transmitters and receivers, and it is only a matter of dollars and cents to obtain same; it is furthermore simply a question of finances to build the lines so that they will present sufficiently high insulation, low enough resistance and balanced induction and capacity.

Stress is here laid upon a good talking circuit, for the reason that with the introduction of automatic exchanges this most essential requirement in any telephone enterprise has been sadly neglected. The advent of the Strowger automatic exchange has also caused a return to the local battery at the subscriber's station for talking, which is contrary to the trend of the present moment toward centralization in all manually operated exchanges. However, the necessity of a ground connection at the subscriber's premises for signaling purposes is against modern practice.

After having disposed of the local exchange requirements for large cities, a few words may be added with regard to toll and long-distance facilities that should be provided. Both the toll business and the long-distance business being of the same nature and closely allied, one switchboard seems to be preferable for both kinds of service. The switching apparatus for this purpose should be so located that either no cable at all or only a minimum amount would enter between the toll and long-distance lines and the point where the same are switched to the local subscriber's lines.

As the toll and long-distance lines are very costly, they ought to be loaded to the fullest extent. To do this effectively the operator should be enabled to keep the lines busy all the time, and, therefore, only a few lines should be assigned to one operator (in Germany they assign only two lines to one operator) while provision should be made to make the connections with the utmost speed. For outgoing calls for such subscribers as frequently use the toll and long-distance lines, provision can be made to call the toll board direct without going first through the local board, by providing a double signaling device; one being the regular signal upon the local board, operated by the subscriber taking the receiver off the hook, and the other a second signal terminating in a distributing operator's section of the toll boards, this signal being arranged similar to the second signal in a two-division signaling system previously alluded to and operated by the subscriber pressing a button.

For incoming toll and long-distance work the same subscribers may have their lines multipled through the toll board so that every operator can connect to them direct.

All toll boards in large cities should be provided with ticket carriers somewhat along the line of the cash system in large department stores, which are operated by compressed air or belts.

By the use of composite circuits much time can be saved, as the calls may be ordered up by telegraph, leaving the lines ready for actual conversations.

THAT "POPULARITY" CONTEST.

In the August number of TELEPHONY, it will be remembered, was printed an article on the voting contest inaugurated by the Louisville (Ky.) *Evening Times* for the most popular business woman in Louisville, or its suburbs, New Albany or Jeffersonville. One of the leading figures in this contest was Miss Marie Yonkers, chief operator of the Louisville Home Telephone Company. She was third in the race at the time this paper called attention to the contest, and was so far ahead of her nearest competitor that there was every reason to believe she would be one of the three big prize winners. All through the contest and up to the day it was decided, Miss Yonkers remained secure in third position, her friends standing by her nobly and swelling her total vote to the enormous number of 121,496. With the coveted third prize of $200 in gold almost within her grasp, she was doomed to disappointment. At the last moment something unforeseen happened that shattered all her cherished plans and brought a strong protest from her legion of friends. The two candidates below her—Misses Maggie Hale and Elizabeth King—combined, the latter throwing her strength to the former, bringing Miss Hale's total vote up to 127,860 and just beating Miss Yonkers for third honors.

The outcome in this instance was altogether unexpected by Miss Yonkers and the general public of Louisville, and the opinion was freely voiced that the "combination" was entirely outside the rules originally laid down in the contest and unfair to Miss Yonkers. It was understood from the first that it was to be the *individual* popularity of any candidate which would guarantee her position in the race and that the combination of contestants was not to be entered into, as the clubbing together of candidates would not in any manner serve the original purpose of the contest, or be a fair standard on which to base the question of popularity. However, at the last moment, for some unknown reason, the managers of the affair ruled otherwise, allowed the Misses Hale and King to combine for the benefit of the latter, and unfairly, it would seem, wrested from Miss Yonkers the honors and emoluments that should by all rights have been hers. There may be justice in such a procedure, but it is not evident on the surface, and the friends who backed Miss Yonkers, as well as all those who took an interest in the contest, cannot but feel that on the merits of the case, third prize should have gone to her, and that the means taken to defeat her, while shrewd and crafty, are not above criticism.

In the contest nearly three millions of votes were cast, the winner—Miss Minnie Brooks—receiving 1,396,563, and Miss Bee Mullarkey coming second with 800,617. The first prize was a piano, pianola and music, valued at $700; the second prize a $300 piano, and the third prize $200 in gold. There were also eight consolation prizes of $25 each, and one of these Miss Yonkers received.

Although on the face of the returns she did not win the coveted prize she strove for, Miss Yonkers is to be congratulated upon the magnificent run she made, and the Louisville Home Telephone Company is to be felicitated upon possessing such a highly popular chief operator.

NEW USE FOR TELEPHONES.

One of the economies practiced by the railroad managers of Iowa is the use of the telephone. The tendency has been to close up many of the small stations because of their unprofitableness, compelling the patrons to go to larger towns. Complaints have been made as to this change of policy and the railroad commissioners have induced the railroad companies to make use of the telephone to a large extent in providing the facilities for the transaction of business. A telephone line is constructed to the station nearest the one that is without a telegraph operator and a depot agent is secured who is not an operator. He conveys messages by telephone to the telegraph company and generally transacts all business in this way. The company saves the difference in salary between a telegraph operator and a depot man to handle freight. A great many of these telephone stations have been established in Iowa during the last year at a great saving to the railroad companies.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

While it may be a presumption on my part to criticise in any way the management of TELEPHONY, or to suggest any policy the publication may adopt towards its employes, it appears to me that your Mr. J. C. Kelsey is adopting a course in his questions and answers that is likely not only to injure your publication, but to retard electrical investigation which may result in the advancement of the art. While the tenor of his replies is arbitrary in the extreme, there are some little short of drastic. An illustration of this is the reply made to the B. F. Telephone Company, on page 100 of August TELEPHONY. Unless Mr. Kelsey is the final arbiter of all progress, the tone of his replies can be greatly improved. In offering this criticism, I trust you will recognize my disinterested position, and receive the same in the spirit in which it is offered.—D. A. R., New York.

The answer which brought this rather severe castigation was in regard to a question, whether eight or ten parties could be called from the switchboard by the ordinary key operation. In four-party service there are usually four distinct keys, corresponding to each selective call. The purpose of the question, which occurred to me, was the fact as to whether keyboards were designed to handle more than four-party service selectively. Personally, I don't know of any system which manufactures an eight, or ten-party key. I believe in party lines. As manager of a telephone system of considerable size, I kept a four-party selective service at my house to observe the shortcomings of such service. In a whole year I did not have reason to complain of a false ring, or confliction of party desires to use the wire simultaneously. For that reason, I am strictly for four-party service. But any man who has had to handle trouble coming from party lines will know from the telephone company's standpoint, that they are not an extraordinarly great money earner, on account of the maintenance trouble. But I was simply bringing out the point that there is no selective system for more than four parties maintained by the large manufacturing companies, where each party is called by his individual operator's key. I confess to going further into the question than it called for, and am glad that I was drastic enough to call the attention of D. A. R., who is a distinguished telephone man, and whose voice and opinion is worthy of the closest attention.

I want to confess the pleasure that this little criticism gave me. For two years I have been on TELEPHONY's staff, and it has taken two years to get such a testimonial. I wish that every reader of TELEPHONY would have the kindness to call halts, or suggest courses of action. When one writes for two years, and hears no sound, not one favorable, or even unfavorable, opinion, it is very discouraging. And not hearing from my readers, I suspect that I have gotten into a habit of being rather radical, or shall I say ultra conservative? This world has grown into a habit of disregarding the man who goes along in the even tenor of his way. To call the attention of the world, or even a small part of it, one has to resort to means which do seem drastic. As TELEPHONY stands for fearlessness, so have I in expression of telephone affairs. What hurts the telephone business as a profession is this utter sphinx-like silence that has hung over telephone progress. Let us all talk. What we need is expression, and more of it. I have known long that I have made extravagant statements, and I want to give notice that I shall continue to do so as long as I shall retain the power of expression.

It is a trait of monopolies, and a distinguished trait of the Bell Telephone Company, that the employes shall not talk, but shall waste their talents in a four-walled office. I will quote one thing, which shall describe what I mean. In 1900, the American Institute of Electrical Engineers asked their members to vote on the first twenty-five leading men in the electrical science. And it was also understood that the first three should be brought out in italics. As a telephone man, acquainted with the work of a deservingly distinguished telephone engineer, I voted him as third factor in the progress of electrical science. I want to say that my vote was alone. Not one vote did this man get, for even a position among the twenty-five, except mine, which gave him third place, along with Lord Kelvin and Edison. Why was this? It is because there is not enough full expression in telephone matters. It would not hurt the employes of the Bell Telephone Company to write and talk, and it would benefit their company. What has helped the Independent field is the publicity, and honesty of their intentions, freely expressed in newspaper and magazine. Electric lights have reduced crime in certain quarters, and publicity in all matters has resulted in their rectification.

I am arbiter of nothing but my own actions. Heaven forbid that I should stand in the way of progress. I have contributed several things in the march of telephone progress, and shall try to keep up my efforts. I am for progress in Independent telephony. What greater calamity could befall telephone engineering than that it should pass back into the control of a monopoly. It is to the interest of every man to stand for success in Independent circles. It is to the interest of employes to perpetuate Independent supremacy. I advocate anything that will help defeat the efforts of the monopoly. If selective lock-out telephone service will help to attain this end, then I stand for selective lock-out service. But I shall continue to stand on the engineering side of all questions, as that is the work of the query department. I am anxious for improvement; I am not arbiter of all progress; I don't want to injure TELEPHONY. I don't want to offend D. A. R. I have often suggested to TELEPHONY that I was getting tired of answering questions, because no one ever answered me. I wish all the readers would help me to improve the tone of my answers by writing me clearly defined questions. In my heart, I thank D. A. R.

Is there any known way of regulating the voltage at a private branch exchange supplied with battery over a comparatively light lead from the central office, other than installing small storage battery sets at the branch? If the battery leads carry twenty-four volt pressure, and the resistance of same is sixty ohms, or over, the drop at the exchange is very high when several pairs of cords are in use. How can this be overcome?—J. G. L., California.

The ordinary method of furnishing battery from the main office to the branch office is a pair of overhead wires, or a pair of No. 19's or No. 22's in a cable. As the question indicates, there would be a considerable drop causing cross talk were it not for a bank of ten two microfarad condensers, bridged across the battery lead at the branch office. The elements going to make cross talk are alternating in character, and allow a condenser full play, acting as an alternating storage battery, as it were. Of course, if you have lamps for signals, which take considerable energy, you will naturally cause a drop, which might cause two or three lamp signals to be very dim. But private branch boards should use

high resistance mechanical signals, or at least signals that do not depend on the amount of pressure furnished. The only function of the condensers is to take care of the alternating current functions, to re-enforce them exactly on time, and prevent cross talk. The licensee companies sometimes use a small floating battery on their small lead, which will take care of both alternating and direct current drafts. These cells are ordinary polarization cells, and information can be furnished you by any storage battery manufacturer. From your question, I cannot exactly guess the particular evil of the drop you encounter, but I judge it to be either cross talk, or failure of lamps to burn brightly, when more than one circuit is in use.

What do you think of using pine for underground cable conduit? Our people are very jealous of their trees, whose limbs grow out over the cables, and by constant motion crack the lead cable and allow slow saturation. Our soil is sandy, and a piece of pine, painted with mineral tar, will last indefinitely, if buried eighteen inches below the surface. We think of trying one lead with the pine, sawed 2x6 inches for bottom and top and 2x2 inches for sides. It will be dressed on all sides and painted with tar paint. At manholes and terminals it would be necessary to protect a short piece with metal covering, so as to completely protect the wood from air exposure.—E. S., Florida.

Have talked with several conduit men at the World's Fair and they agree that no objection can be raised to the proposed work. The joints would be hard to hold, unless dovetailed, or well wrapped. We all know that if wood is free from air exposure, it will last indefinitely, unless attacked by certain worms. On the whole, it would make a good underground system, considering the slight depth and accessibility.

In our office we use three currents for ringing, alternating for the single party bridged bells and positive and negative pulsating current for the four-party bells, two on each side of the line, connected to ground. Some time ago we had a second board installed. In ringing parties on this board we would ring one party on the opposite side of the line, but it would ring all right when plugged in on the first board. The first board cords would ring all right through the new board. There is a permanent ground on generator, and in ringing party lines we ring through one side of the line to ground. On the first board one side of the line is grounded upon ringing, but not so on the new board. Would this make any difference? Why should it make trouble, when ringing through one board, and not when ringing through first board, with same cords?—R. M. G.

It is not necessary to ground the unused side during ringing, although a good plan. The wiring in both boards should be exactly the same. If the keys in the new board do not have idle springs grounded, it would be well to wire them to ground. If the plugs of the old board fit the new board, and they ring the bells correctly, and the cords of the new board fit the jacks of the board and ring those bells correctly, it ordinarily looks like a complete test. The only reason left would apparently be that the keys are not connected exactly alike. Apparently, this is not the cause, but it seems nearest the trouble.

We have grounded party lines, "rural," in length from one and a half miles to thirty miles, of No. 12 BB Roebling wire. We have an average of eleven instruments on a line, 1,600 ohm bells and an express board, with 1,600 ohm bridging and 120 ohm series drop. The lines parallel each other as far as sixteen miles, with others not that far. We have some trouble with people who are out on the lines about ten miles and upward trying to talk to their neighbors from four to eight miles away and being unable to do so, as the connection at central makes it fainter than cross talk. I can account for the faintness, which was aside from the resistance of the line, and due to so many long-eared neighbors who stay on the line so much as to become closely related to roosters. But I would like to know if the unbalanced line paralleling on the return loop could neutralize it or if it should do that, why would not enough leak across by static capacity to compensate to some extent for that which it neutralizes (if it does), which came back on the other wire by conduction. In other words, does the static current induced in the neighboring wire oppose or assist the one produced by conduction, via central? With exactly the same conditions people could talk from either of the lines in question to some one on another lead of poles, even farther from central in wire miles than in the first premise. Have I missed it entirely?—H. E. A. L.

Roosters express the conditions nicely. To get at the conditions suggested, lines *A* and *B* in Fig. 1 shall represent subscribers' lines on the same poles, with *COD* the clearing out drop at central. Let us consider a single impulse starting at *A*. It will flow toward the exchange, as indicated by the arrow underneath the line. It will flow to the *B* subscriber outward from the exchange, as shown by arrow underneath line *B*. This is the conduction part. The current flowing in *A* induces a current in *B* in the opposite direction, and is shown by arrow above line *B*, and is the same direction as the current of conduction. It looks then that it is assisting the current. But the current in *B* flowing outward also induces a current in *A* in the opposite direction, shown by arrow over line *A*. Then it assists here, too. Then it would be, if this were true, that there would be an endless amount of helping increments, that would to all intents double or triple the amount of current originally flowing. But such a condition could not be true, for the current that would tend to flow from *A* to *B* by static means would neutralize the current that would flow from *B* to *A*, and would leave the conduced current free from any effects, causing it to act just as if the line were pulled out straight. A nice test for static capacity would be to open the lines at the exchange, and make lines *A* and *B* act as plates of a long wire

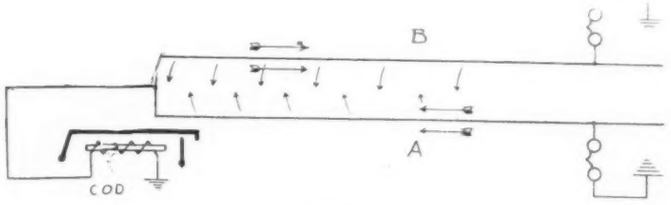


FIG. 1.

condenser. Then you would have a talking circuit that would take advantage of the capacity effect. As long as the wire runs back on itself, these capacity effects can be of neither assistance or detriment. As to talking between leads, it would be more impossible, from the capacity effect, as the plates of the condenser would be so far apart, but from the leakage standpoint, the separate leads are no more exempt from this leakage effect than if close together, and parallel. I would lay the faintness on the roosters to a certain extent, and would remedy this by placing quarter microfarad condensers, or high resistances in the talking circuit. In this way, the shunting effect of receivers and secondaries will be weakened. Condensers only allow ringing to be done, if a receiver is left off the hook, or in the hands of a rooster. The resistance would help transmission. And it might be that those 120-ohm series drops are left in the circuit, although that is hardly possible. If not sure, look, as they would give that faint effect to perfection.

I have watched for a reply to the trouble of the W. T. and S. Company in July TELEPHONY, as I had a case exactly like it a few months ago, where No. 5 could not ring No. 4, but could ring everyone else on the line, and No. 4 can ring No. 5 as well as all the others. Both telephones had been changed, and the connection examined, but it did not remedy the trouble. I had a ground rod driven in the cellar of No. 5 station, and connected to the old ground rod, making two grounds, each in a different strata of soil, which made it work O. K.—R. C. Cutting, LaGrange, Indiana.

In regard to the question of W. T. and S. Company in July TELEPHONY, I wish to say that while a defective generator at No. 5 and a bad ground at No. 4, which I understand J. H. M. to mean in his reference to the question, would cause such trouble, still the same trouble may occur when all the instruments on the line are in good condition. If there be unnecessary resistance in the No. 4 branch of the line, and a considerably greater resistance in the No. 5 branch, it is likely to result in the generator at No. 5 not being able to send enough current through the ringer magnet at No. 4 to operate the ringer, while at the same time the No. 4 generator may be able to ring the No. 5 bells. I think it is probable that there is a

bad ground at station No. 4 and a worse one at No. 5.—W. F. Hankins, Gordon, Nebraska.

Both Mr. Cutting and Mr. Hankins agree on the question practically, and the readers will see that their reasoning is good, and that experience proves their contention. It seems to me that these gentlemen have given the solution.

In Fig. 2, P is a primary coil, with 100 turns of wire and a resistance of ½ ohm; S is the secondary coil with 4,000 turns of wire and a resistance of 250 ohms. In Fig. 3, P' and P'' are primary coils with fifty turns of wire each and a resistance of ¼ ohm each. S is the secondary coil with 4,000 turns of wire and a resistance of 250 ohms. The coils in Fig. 3 are connected in multiple to a battery of three volts and one ampere, and in Fig. 2 the coils are placed in series. What will the amount of electricity be that will flow through the transmitter in Fig. 2; also in Fig. 3? What will be the volts and amperes in the secondary coil S in Fig. 2 and in Fig. 3? What is the resistance of Kellogg transmitter?—R. N. T., Arkansas.

Having a local battery subscribers' transmitter, Kellogg, at hand, I made some measurements with a voltmeter. I found for this one a normal resistance of 15 ohms, and ranging up to 300 ohms for loud speaking. With three volts battery pressure, this would cause a primary current to

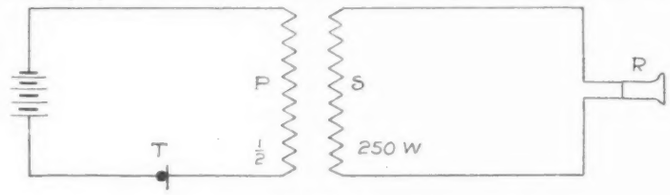


FIG. 2.

flow, with a value of one-fifth amperes. While in use the amount would be less, according to the range of the operator's voice. This is not taking into account the resistance of the primary, which, while it has a bearing on the case, need not be considered here, as the resistance of the transmitter is varied and always higher to such an extent as to make the transmitter resistance practically out of calculation. There naturally would be a gain in current in Fig. 3, but not enough to make any great difference. About the volts in the secondary, that is a question yet publicly undetermined. The current in the secondary would be a function of the pressure, and the external resistance in the circuit. I am now in possession of instruments which shall determine these values, when the laboratory is under working order. All I can do is to surmise what might be the electromotive force of the secondary coil. As the primary winding of the coil is ½ ohm, and the normal resistance of

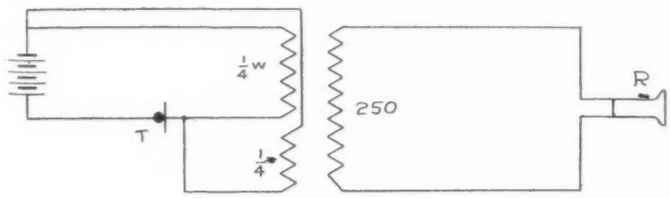


FIG. 3.

the transmitter is 15 ohms, and the pressure of the battery is three volts, then the pressure across the primary terminals would be 1-30 of three volts, or 1-10 of a volt. The relative windings of primary and secondary are as 100 to 4,000, or 1 to 40. If the primary terminals have a pressure of 1-10 of a volt exerted, then the pressure across the secondary terminals would be forty times as great, or about four volts of alternating current pressure. One could easily doubt this statement, if he would put his fingers across the secondary terminals, for he would get quite a shock from the voice currents. This would seem greater than four volts. Yet there is every reason to suspect that four volts is about as high as the value gets. In common battery practice, it is a safe statement that the secondary electromotive force is not above three or four volts. The currents may be said to be so feeble that ordinary measuring devices cannot accurately record them. During the coming year I expect to publish many quantitative measurements in the query column. Concerning the amount of current, if the secondary voltage is four, the current flowing in the secondary would be four divided by 250 ohms, or .016 amperes. With an eighty-ohm receiver, the current would be less, or four divided by 330, or .012 amperes, considering that no losses due to transformation exist. As they do exist, the results .016 or .012 are not true.

HUMMING OF TELEPHONE WIRES AND POLES.

"What causes the humming of telephone wires and poles; what connection has it with the weather; can it be used for weather forecasting?" is a question that is frequently asked.

The telephone pole merely transmits to the ear the humming of the wires overhead. Its own vibrations are so slow that they make no audible sound. The wires strung from pole to pole are set into oscillation by the wind, somewhat as the strings of a violin are set into vibration by the bow. In skillful hands the violin bow can be made to bring forth from the string one powerful fundamental note and several overtones of higher pitch, but in perfect harmony with the fundamental. But the wind is a very unskillful performer, and brings forth at the same time not only the deepest fundamental bass note of the wire, but a great variety of overtones, both harmonious and discordant. In fact, the many wires strung overhead, from pole to pole, constitute splendid aeolian harps.

The slowest oscillations of the wires may be seen or felt, but are not audible. The bass notes and the higher tenor we hear but faintly when we stand midway between two poles. If the ear is pressed against a pole we hear more especially those notes to which the wooden pole can most easily respond; sometimes a special note, started by the wire at the upper end of the pole, is reinforced by resonance, and that which is only feeble on the wire becomes most prominent on the pole. Of course, the stronger the wind and the more gusty it is, so much the more active will be the humming of the wire and the pole. If the wind blows lengthwise of the wire it will bring out a different combination of notes from those produced by a transverse wind. Therefore, the direction of the wind has some influence upon the humming of the telephone poles, but the direction of the wind depends upon the location of the storm center, and is a good basis for local prediction as to rain. Hence, those who have studied the humming very closely have frequently declared that they can tell the weather by the character of the humming.

A prominent meteorologist has made a series of observation and arrives at the following conclusions:

* * * the humming of wires running east and west invariably presaged a fall of temperature, often ten or more hours in advance of the thermometer; the humming of wires running north and south advised a rise in temperature, almost always several hours in advance of the thermometer. Wires running east and west never hummed together with wires running north and south, not even when the same wires running along an east and west street turned down north and south side; only that portion of them hummed that indicated a rise or fall in temperature, as explained above. If one part hummed the other part was silent.

It seems evident that the humming is due entirely to the action of the wind. There is apparently no necessity for assuming that electric currents, either in the air or in the wire, or any other mystery, need to be considered. Those who invoke electricity must give some plausible reason why the current should oscillate with such frequency as to cause the rapid vibrations that must exist in order to cause audible sound.

The telephone appears to be encroaching upon the domain of the telegraph, much as the trolley line is cutting into the business of the steam railroad.

Loaded Telephone Lines in Practice

DR. HAMMOND VINTON HAYES

THE mathematical discussion of the theory of loaded telephone lines has been fully given in the writings of Prof. M. I. Pupin[1] and Dr. G. A. Campbell.[2] In the present paper it is intended to state briefly the results which have been obtained by the use of loading coils on many of the telephone circuits of the Bell companies. In every problem affecting the transmission of telephone waves over a line, there are two factors to be considered,—the attenuation and the distortion of the waves. The loss of energy of the waves upon the line must be kept at a minimum and the several component waves of the telephone or voice waves must be transmitted without unequal relative impairment.

DISTORTION.

The introduction of lumped inductance in the form of loading coils upon a telephone line tends to increase the distortion by the possible unequal reflection of the component waves of different periodicities, and by the possible unequal attenuation of the several waves in passing through the coils.

REFLECTION LOSSES.

The mathematical work of both Pupin and Campbell showed conclusively that if several loading coils lay within a wave length on any particular loaded circuit, and the coils themselves were theoretically perfect, the circuit was distortionless. The spacing of the coils upon a circuit in practice, therefore, depends simply upon a determination of the highest periodicity that should be retained in the telephone waves in order to maintain the character of the voice waves unimpaired. It has been found convenient in studying the spacing of loading coils to consider the number of coils which would be passed by a wave front on each particular circuit in the unit of time, or a second. As the velocity of all waves upon a given circuit is the same, and as the wave length for any periodicity can be readily determined from the velocity, this convention makes it possible to readily determine the number of coils lying within any particular wave length.

A large number of long telephone circuits have been equipped with loading coils, the spacing of the coils upon the several circuits being such as to produce a range of the number of coils per second between 13,000 and 7,000. A comparison of the transmission over these several circuits has shown that the quality of transmission is not appreciably impaired even with the lower number of coils per second. This seems to indicate the lack of importance of the overtones of very high periodicity in the successful transmission of speech.

It can be said, therefore, with considerable certainty that the distortion due to reflection losses in a loaded telephone circuit can be neglected, provided the coils are so spaced upon the line as to give at least 7,000 coils per second, and that this spacing of the coils is substantially uniform throughout the line.

DISTORTION IN COIL.

To entirely eliminate distortion in a loading coil, it is necessary to have it so designed that the effective resistance of the coil to all the essential periodicities of the telephone waves shall be the same. Such a coil is theoretical, and cannot be obtained in practice. A loading coil is primarily one so designed as to provide a required amount of inductance, and must, of necessity, consist of several turns of wire. Moreover, to prevent attenuation, it is imperative that the resistance of the coil be kept as low as possible. To make the resistance of the coil low, the wire employed should be of copper of large size, and the number of turns of wire in the coil should be kept small. A reduction in the turns can, other things being equal, be most easily obtained by the use of iron for the core of the coil. If the coil is made entirely of copper, the effective resistance of the coil with the frequencies within the range of telephone periodicities will differ from the resistance by an amount corresponding to the losses due to eddy currents in the copper. If iron forms a portion of the coil, there will be, in addition to the eddy-current losses in the copper, eddy-current losses in the core, as well as hysteresis losses in the iron, which will augment the difference between the resistance and the effective resistance. As it is impossible to eliminate the eddy current and hysteresis losses entirely, the effective resistance of a loading coil will vary with different periodicities, and thereby tend to produce distortional losses in the transmitted telephone waves. The difference between the resistance and the effective resistance, at telephonic periodicities, can be made much smaller in a coil composed entirely of copper than in one having an iron core.

Practical and commercial reasons demand an iron-cored loading coil, provided that such a coil can be so designed that its use in a telephone circuit will not be productive of appreciable distortion. To determine whether, in practice there was appreciably more distortion introduced by loading coils having iron cores, as compared with those made entirely of copper, the two circuits first loaded were equipped, one with iron-cored coils, and the other with copper inductance coils. The circuits were each about 1,000 miles in length. The coils used on these two circuits were spaced alike, and had the same inductance and approximately the same resistance. The effective resistance of the coil having an iron core was about 15.5 ohms at a periodicity of 2,000 per second and that of the copper coil 11.8 ohms at the same periodicity. These circuits thus loaded were compared with each other with the greatest care, and no difference was apparent either in the character, or quality, of the telephone transmission. These tests are again confirmatory of the fact that the suppression or reduction of the waves of the highest periodicities of the voice waves does not appreciably affect the quality or intelligibility of transmitted speech. This experiment was considered as demonstrating conclusively the possibility of the commercial use of loading coils having cores of iron.

LOADING COIL.

A discussion of the theoretical dimensions of loading coils for different classes of circuits may be found in Dr. Campbell's paper, to which reference is above made. In practice the size and cost of the coil are factors requiring serious consideration. For aerial circuits, where the size of the line wire is large, and consequently the resistance of the circuit small, it is of the utmost importance that the effective time-constant, $\frac{L^1}{R^1}$, of the coil should be made as large as is consistent with reasonable cost. Except so far as the cost is affected, the size of the aerial loading coil is of no special moment, as the coils can be mounted singly upon the poles. The time-constant of a coil can be increased by enlarging its size, but such increase in size increases its cost. The best

Paper read at International Electrcal Congress, St. Louis.

1. *Trans.* Am. Math. Soc., July, 1900; *Trans.* Amer. Inst. Elec. Eng., Vol xvii, May, 1900.

2. *Phil. Mag.*, March, 1903.

commercial loading coil is, therefore, the smallest coil that will give the required inductance and the largest effective time-constant.

Following the theoretical considerations as deduced by Dr. Campbell[3], the resistance of the coils which have been used on aerial circuits has been made 2.4 ohms. The design of the core, the permeability of the iron, the subdivision of the iron and the copper have been made such that a loading coil has been produced having an inductance of .25 of a henry, a time-constant of .048 second, at a periodicity of 1,000 periods per second, and a bulk of approximately 314

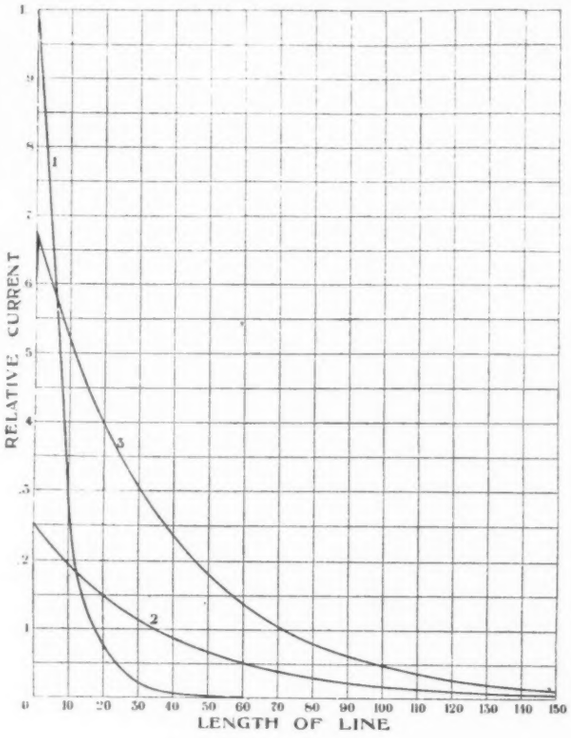


FIG. 1.

cu. in. This coil is toroidal in shape, 10 in. in diameter and 4 in. high. It has an effective resistance of 15.5 ohms at 2,000 periods per second.

Coils designed to be used on cable circuits in which the size of wire employed is much smaller do not require to be made of as low resistance as the coil above described; consequently their size and time-constant may be made much smaller. Large numbers of cable loading coils have been placed in service, their design varying with the character of the circuit upon which they are to be used.

REFLECTION.

In the terminal apparatus at present used in telephony, or where there is a condition of non-uniformity in the character of the line, the telephone waves suffer a reflection, which, in many cases, is effective in materially increasing the attenuation. This reflection is particularly pronounced at the point where an unloaded section of line is connected to a loaded section. The amount of reflection is greater the greater the divergence from homogeneity. Thus a section having large inductance per mile, when connected with a non-loaded section, exerts a larger reflective action than one having a small inductance per mile.

In practice, the effect of reflection is of very considerable importance, particularly when the loaded section is not relatively long. Theoretically, these reflection losses may be eliminated by the use of a perfect transformer introduced at every point of non-uniformity in the line. Even could such a perfect transformer be made its introduction on commercial circuits is open to practical objections, and, as a substitute, its equivalent, in the shape of a series of coils of varying inductance, has been employed. This arrangement of coils of varied inductance is known as a "terminal taper." The arrangement of the several coils constituting the taper is such that a coil having an inductance somewhat less than that of the coils used on the loaded section is placed nearest the loaded line, a coil of inductance somewhat less than the first taper coil is placed next in order, and a coil of small inductance is placed nearest the non-loaded section, or the terminal apparatus. The spacing of the coils in the taper corresponds with that of the coils of the line of which it is to form the terminal.

3. *Philosophical Magazine*, G. A. Campbell, March, 1903.

RESULTS OBTAINED ON COMMERCIAL CIRCUITS.

The following figures illustrate the results which have been obtained on several typical commercial circuits. In what follows, all comparisons are made on the basis of relative attenuation between similar circuits loaded and unloaded, without reference in any way to distortion or quality of the transmitted speech. The curves shown in these figures are the results of actual tests, made on commercial loaded circuits, using standard terminal apparatus at the transmitting and receiving stations.

LOADED CABLE.

In Fig. 1 are shown the results obtained in tests of a heavily loaded standard telephone cable. In this cable the wires are .03589 of an inch in diameter, having a resistance of about 96 ohms per mile of circuit. The mutual capacity between the two wires of the circuit is .068 of a microfarad per mile. The inductance added to the circuit by the loading coils amounted to about .6 of a henry per mile. In this

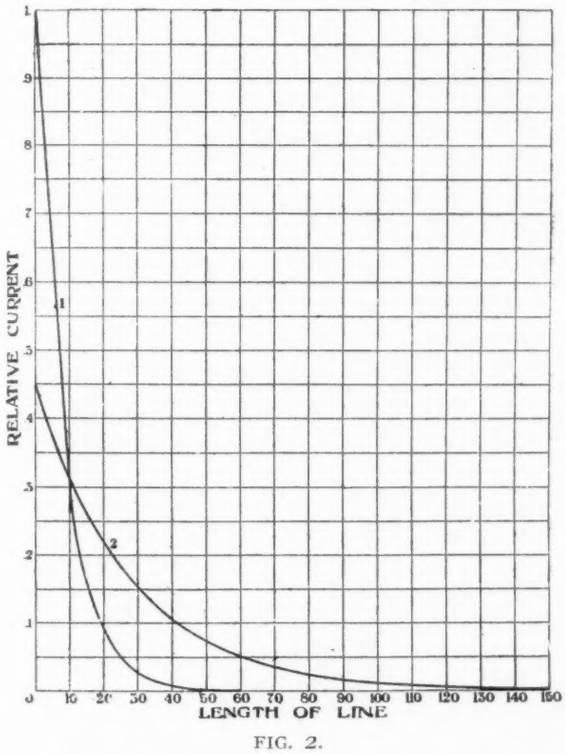


FIG. 2.

figure the abscissæ represent lengths of cable and the ordinates the relative strengths of current. Curve 1 is the one representing the attenuation of current on an unloaded circuit as the length of cable is increased.

It will be seen that the attenuation increases very rapidly as the length of cable is increased. Curve 2 represents the attenuation on a similar circuit but loaded as above described, the terminal telephone appartus being placed directly at the ends of the loaded cable, thereby obtaining the full effects of reflection. It will be noticed that the initial

current on the loaded circuit is about one-quarter of what it is on the unloaded circuit. Moreover, the transmission on shorter lengths of the loaded circuit under these conditions is much poorer than the transmission over similar lengths of the same cable circuit unloaded. But the rate of attenuation per unit of distance is much less on the loaded than on the unloaded circuit; so that for the longer lengths of circuit the transmission is superior on the loaded circuit to that on the same lengths of unloaded circuit. Curve 2 shows the attenuation when no terminal tapers are employed and the reflection is a maximum. If terminal tapers are em-

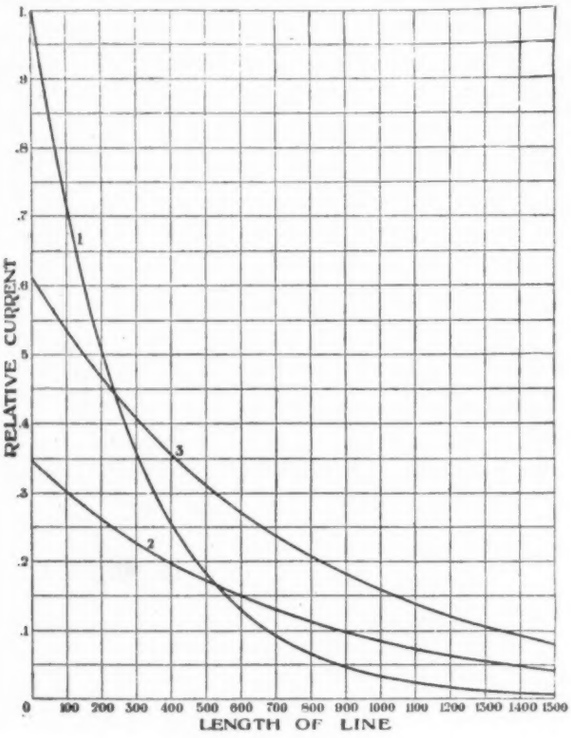


FIG. 3.

ployed at the two ends of the loaded circuit and the telephone transmitting and receiving apparatus is connected directly to the tapers, the attenuation on the loaded circuit is represented by Curve 3. Here again it is seen that the initial current is considerably less than that on the unloaded circuit and that the transmission on short lengths of circuit is better on the unloaded than on the loaded conductors, but the introduction of the tapers on the loaded circuit has more than doubled the initial current and has shortened by about one-half the length of circuit which showed the unloaded circuit superior. A comparison of Curves 2 and 3 shows how great a factor the reflection losses are between the terminal apparatus and a loaded circuit and the importance of the taper in reducing these losses. In practice it has been found that reflection losses can be still further reduced and under special conditions almost, if not entirely, eliminated.

In the case above described a large amount of inductance has been added to the circuit. The results which have been obtained upon cables where less inductance has been added are shown in Fig. 2. In this case the cable is substantially similar to that previously described. Upon it loading coils are placed so as to bring the inductance of the circuits up to approximately .17 of a henry per mile. In other words the inductance is less than one-third of that in the case just described.

In Fig. 2, Curve 1 is similar to that in Fig. 1 and represents the attenuation of the telephone current in an unloaded circuit in the cable. Curve 2 represents the attenuation in the lightly loaded circuit when no tapers are employed and the telephone transmitting and receiving apparatus are placed at the terminals of the loaded cable. It is to be noted that the reflection losses are much less in the case of the lightly loaded cable than is the case in that having the heavier loading. In fact for shorter lengths of cable the lighter loading is more effective in transmitting the telephone wave than the heavier. For longer lengths, however, the heavier loading gives better results. With proper apparatus at the terminals of the loaded cable to reduce reflection losses, much less attenuation would result than is indicated by Curve 2.

LOADED AERIAL CIRCUITS.

In Fig. 3 are shown the results which have been obtained on open-wire circuits composed of copper wire weighing 435 lbs. to the mile. On these circuits loading coils were so placed as to make an inductance of about one-tenth of a henry to the mile. Curve 1 shows the attenuation with various lengths of line upon a similar unloaded circuit, and Curve 2 shows the attenuation on the loaded circuit when the telephone transmitting and receiving apparatus are placed directly at the ends of the line without tapers. Curve 3 shows the attenuation under similar conditions when tapers are employed. The results resemble those obtained with loaded and unloaded cable. There is a large reflection loss which is considerably reduced when tapers are employed. Even with tapers the loaded line for shorter distances is inferior to the unloaded. The point particularly to be noticed is the relative slope of the curves in the two cases indicating that the benefits to be obtained from loading open-wire circuits are less than with cable circuits.

Fig. 4 illustrates the results which have been obtained from loading open-wire circuits using a conductor weighing

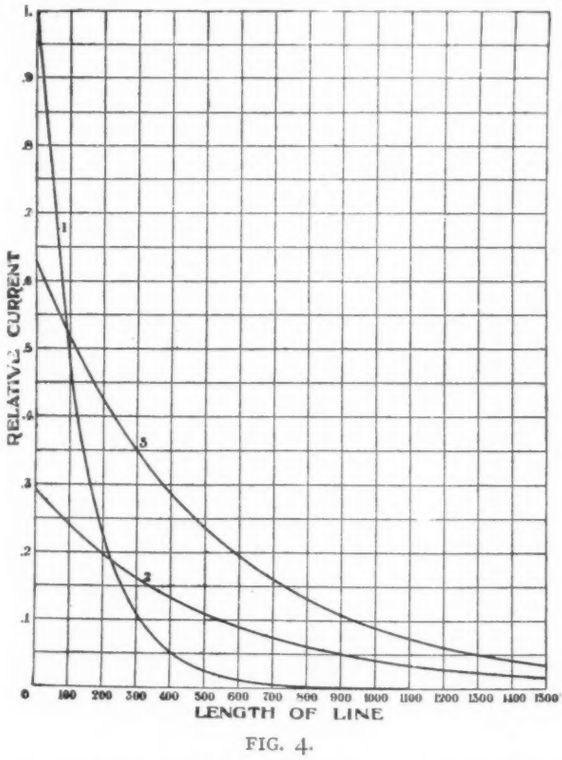


FIG. 4.

176 lbs. to the mile and having an added inductance equal to about .1 of a henry to the mile. As before, Curve 1 represents the attenuation on a similar unloaded circuit; Curve 2, the loaded circuit without tapers, and Curve 3, the loaded circuit with tapers.

GENERAL CONSIDERATIONS.

The above curves show the results which have been obtained by the use of coils of considerable inductance added to open-wire and cable-telephone circuits and may be considered as typical of the results obtained on similar circuits

of different capacity or composed of wire of different size. As before stated the curves illustrate simply the relative volumes of transmission under the various conditions described.

In the case of cables there is a distinct improvement in the quality of the transmission produced by the introduction of the loading coils, the voice of the speaker being received more distinctly. The high insulation which can be maintained at all times on cable circuits renders it possible to introduce loading coils upon the circuits without danger of materially augmenting leakage losses. The marked diminution in attenuation, the improvement in quality of transmission and the ease with which inductance coils can be placed on cable circuits without introducing other injurious factors, such as leakage or cross-talk with other circuits, renders the use of loaded cable circuits especially attractive.

The reduction of attenuation that can be obtained by the introduction of loading coils on air-line circuits, even under theoretically perfect conditions, is less than can be obtained on cable circuits. This difference in the effectiveness of loading between the two classes of circuits, as far as attenuation is concerned, can be explained by the fact that on a cable circuit the capacity is large and the inductance of the circuit itself is practically negligible, due to the proximity of the two wires of the pair. On aerial circuits, on the other hand, the distance between the outgoing and return wire is such as to make the capacity of the circuit much less, and its inductance much greater. This larger self-induction of the open-wire circuit operates to decrease the attenuation, and, as it were, to rob the loading coils of part of their usefulness. Again, the insulation of an aerial circuit cannot be maintained as high as that of a cable circuit, so that the added inductance due to the introduction of loading coils upon the line tends to increase the losses due to leakage.

Moreover, there is not the same improvement in the quality of transmission on a loaded aerial circuit as compared with a similar circuit unloaded, as is found between loaded and unloaded cables. Initially, open-wire circuits are practically free from distortion, whereas the distortion on cable circuits of long length is considerable. The addition, therefore, of loading coils to aerial circuits cannot be expected to effect any improvement in the quality of transmission, whereas in the case of cables the introduction of the additional inductance renders the circuits practically distortionless and effects a marked improvement in the clearness of the transmitted speech.

In presenting this brief summary of the operation of loaded telephone circuits, it is desired to make acknowledgment to Mr. H. S. Warren and Mr. E. H. Colpitts for the solution of the many problems involved in the design of suitable coils for use in carrying out this invention, and to Mr. W. L. Richards and Mr. A. N. Mansfield for the careful tests upon which the curves above shown are based.

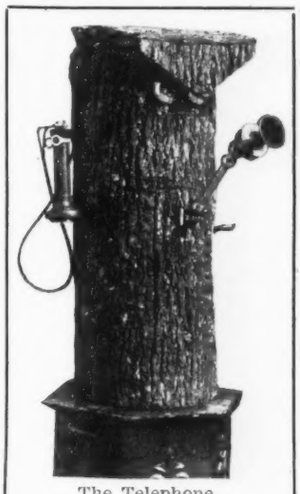
TELEPHONE AIDS IN SUBDUING FIRE.

While it has become so common as to be nothing unusual for farmers served by rural telephones, in cases of fire or accident to summon help by telephone, which they would otherwise be unable to call, a striking incident of this nature happened near Arcadia, Wisconsin, on August 27 last, in which the rural service of the Western Wisconsin Telephone Company played an exceptionally helpful part. Threshing was in progress on the farm of Fernholz Brothers, several miles from Arcadia. Fire was discovered in a stack of barley. The threshers were unable to put the fire out. A messenger was sent to the next neighbor's house, where, by telephone, he called the city hall in Arcadia and asked that the fire engine be sent to the scene of the fire. The engine was immediately dispatched and arrived on the farm in time to do efficient service in subduing the flames and confining the fire to one setting of grain, water being pumped from a creek running through the yard in which the grain was stacked. A serious conflagration was averted and large loss prevented. Thus again have circumstances demonstrated that of all labor-saving devices on the farm, the telephone is the greatest boon. This is the third case of fire on farms in less than one year where the rural service of the Western Wisconsin Telephone Company has been the ready means of calling help and averting great loss.

A TREE-TRUNK TELEPHONE.

The Inventor.

The accompanying illustration shows a unique telephone, made from the trunk of the tree, and the clever artisan who constructed it, Ed. A. Peters, of Independence, Iowa. The telephone is a perfect working instrument, and during the recent convention of the Northeastern Iowa Telephone Assn., at Independence, it was installed in the convention parlors for the use of the members of the association. The tree trunk used in making the telephone was hollowed out, and all the working parts placed in position the same as in any perfect telephone. Mr. Peters is superintendent and electrician of the Buchanan County (Iowa) Telephone Company. He has been engaged in the telephone work for the past six years, two of which were spent in a telephone factory. The remainder of the time he has been engaged in exchange work, in the Independent field in northeastern Iowa. He is a thoroughly up-to-date telephone man, an excellent workman, and it is said of him that "he leaves his trade mark on all his work," which in Mr. Peters' case is the highest form of praise.

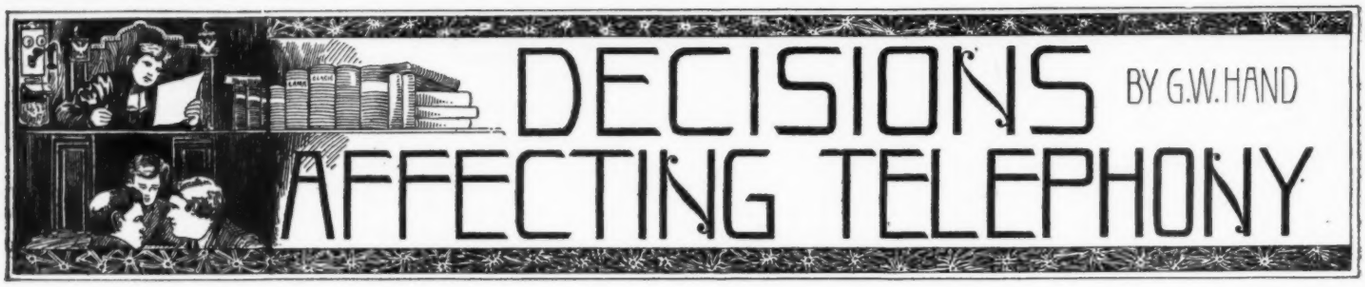


The Telephone.

TELEPHONING FROM MOVING CARS.

It is announced that the cars of the St. Louis, St. Charles & Western Railroad, running between St. Louis and St. Charles, Mo., about twenty miles, will be equipped with telephones by the American Car Telephone Company, enabling passengers in the cars to communicate with offices or stations along the line, while under way. The connection between the car and stationary telephone will probable be by a separate trolley and wire.

Four telephones have been installed this season at the United States Army rifle range at Las Moras Mountain, near Bracket, Texas, between the targets and the firing points. It has been found by this means that at the 2,000-yard range the bullet takes 5.9 seconds on its flight, leaving the muzzle of the rifle at the rate of 2,300 feet a second and decreasing in velocity to 672 feet a second at the target. A listener at the target telephone after a shot has been fired hears two reports, one coming instantaneously over the wire and the other reaching the marking point through the air a fraction of a second before the bullet strikes the target. This demonstrates that a person exposed at a range of 2,000 yards would have time to dodge behind the breastworks after hearing the report of a shot.



LICENSE FOR USE OF STREETS.

The city of Fort Smith, Arkansas, has an ordinance which provides as follows: "That every person, light and power company, street-car company or other corporation that shall erect, maintain and use any pole or poles on any of the public streets and alleys of this city shall pay to the city annually, as a license fee therefor, a sum equal to twenty-five cents for each and every pole so erected, maintained or used on said streets and alleys by such person, or by such telegraph, telephone, electric light, power company, street-car company or other corporation." Another ordinance makes provisions and authorizes companies of the nature above described to make use of the public streets in the city for the purpose of setting poles, stringing wires and erecting other necessary fixtures. Some time ago demand was made on the Fort Smith & Van Buren Electric Street Railway, Light and Power Company for a sum equal to the total fees that the company owed the city under the terms of the ordinance. The power company refused to pay the amount, or any part of it, and suit was brought.

Several cases of this nature have heretofore been discussed in this department in which it has been said that the true test of the validity in such cases is whether the amount asked by the ordinance is a sum to provide the actual expenses of inspection of the poles and other fixtures or whether the amount asked is in the nature of a revenue in the way of a rental for the use of the streets. Naturally the power company took the position at the trial that the sum asked was to provide a rental revenue and not to provide a sum for inspection under the police power. The Supreme court of the state said in disposing of the case in part as follows: "Appellee (the power company) contends that the twenty-five cents demanded by the city of Fort Smith for each pole is an 'explicit demand of rental for the use of the streets.' The ordinance requires every person and corporation who shall erect, maintain and use any pole or poles on the public streets and alleys of Fort Smith to pay to the city, as a license fee therefor, a sum equal to twenty-five cents for each pole. The sum is required to be paid as a license. As used in the ordinance, the word 'license' means the sum paid for permission to erect the poles and maintain the same in the streets and alleys of the city, for the purpose of defraying the expenses of regulating and controlling the use of the same, under the police power of the city. This is necessary for the protection of the public against the electricity with which the wires are liable to be charged, against the falling of poles and the obstruction of the highway."

The power company raised the further question that the proper officers received full compensation for doing the work of a nature like this for which the expenses were provided by regular taxation and that the city had no authority to add the special burden on the individual companies. The court said on this point that the city had authority to provide any reasonable regulations under the police power and had authority to charge the company or companies the expense of carrying out such reasonable regulation. The case is but another growing out of the effort to escape these special taxes. Invariably the collection of fees of this nature has been upheld by the courts when the amount collected is not in excess of the actual expense of inspection. There seems no other way but to pay them, which the company above named was compelled to do.

City of Fort Smith v. Hunt, 82 S. W. 163, decided by Supreme Court of Arkansas, July 2, 1904.

ADMISSABILITY OF EVIDENCE CONCERNING CONVERSATIONS OVER TELEPHONES.

June 30 in a criminal case before the Supreme court of Nebraska, in which the question of the admissability of the evidence of telephone operators was in question, in which a certain witness had testified absolutely that she had a conversation with the defendant in the suit, and at which no attempt was made to cross-examine, either before or after the evidence was given, as to the witness' means of knowing the identity of the person conversing over the telephone with her, it was held that the evidence was admissable and that its weight was a subject for consideration by the jury in the case.

Lillie v. State, 100 N. W. 320.

PERSONAL INJURY CASE IN SOUTH CAROLINA.

P. D. Gilreath of Pickens county in the above state is the defendant in a suit by one Bertie Smith for damages received by driving against one of defendant's telephone wires, which had sagged sufficiently across a road to catch the top of the buggy in which plaintiff was driving, thus pulling her from the rig as it drove under the wire. The case was tried in the Common Pleas court and a verdict was given Gilreath. The Supreme court has reversed this decision, and the case will be tried anew. The right of action relied on by the plaintiff was based on section 1375 of the code of laws which makes it actionable to place or allow to be placed any obstruction in any of the public streets or roads of the state. The discussion of the higher court brought out two or three important legal points of sufficient importance to warrant their insertion here. It was said that it is a question of law for the court, and not of fact for the jury, whether a person is required by statute to remove an obstruction from a highway; in an action under the statute to recover damages for obstructing the highway, recovery does not depend upon negligence, but for obstructions not forbidden by statute, it is incumbent on the plaintiff to show not only that injury was suffered, which was caused by the defendant, but that such injury was the result of negligence; in an action to recover damages for injuries caused by negligence in permitting telephone wires to obstruct a highway, the question of notice to the owner of the wires is an important element in determining defendant's liability. The second statement referred to is based on sound reason and is doubtless the law in all jurisdictions that obstructions *per se* in highways create liability against the person placing them in the highway only when the statute provides that the obstructions shall make the creator of them liable; in all other cases it is a question of fact whether there has been negligence in placing the obstructions. In the one case it is only necessary to show that the obstruction existed and that injury resulted; whereas, in the second situation, it is incumbent to show the existence of the obstruction, negligence and injury. It should also be remembered that contributory negligence will relieve from liability in either case. The re-trial will

probably bring out the above points more fully, and the case will be again referred to at that time by this department.

Smith v. Gilreath, 48 S. E. 262. Decided by the Supreme Court of South Carolina, July 4, 1904.

INJURY CAUSED BY ELECTRIC CURRENT CONVEYED OVER TELEPHONE WIRE.

There is a case pending in the South Carolina courts of interest on the question of liability for injury caused in the above manner. The Gordon Telephone Company, which operates in Charleston county of the above state, has its wires in a certain locality stretched above the wires of the Charleston Consolidated Railway, Gas and Electric Company. Recently, in some way, one of the telephone company's wires became sagged sufficiently to come in contact with the electric wires, from which source electricity was conveyed over the telephone wire. One Parsons came in contact with the charged wire and received a shock from which death ensued. Suit was brought against the two companies to recover damages. The case has been before the Supreme court of the state on demurrer by the electric company, which claimed that a cause of action had not been established against it "in that there is no allegation in the complaint either that the electric company had notice of there being a telephone wire in contact with its electric wires or that sufficient length of time had elapsed to enable the electric company to have discovered the presence of the telephone wire." The above court said in disposing of the demurrer: "The extent to which wires conveying deadly currents should be insulated or otherwise guarded must be decided by a jury under the facts of each case . . . inasmuch as the defendant (the electric company) impliedly admitted by the demurrer that the accident occurred by defective insulation, a good cause of action was stated." The liability of the electric company, while not established by this ruling, is made to depend on the finding of the jury which will dispose of the case. The liability of the telephone company was not considered in the appeal and the suit is now referred back to the trial court for a hearing on the merits. Many difficult questions are involved in this kind of cases, but it would seem that the mere presence of a telephone wire on an electric wire which is supposed to be insulated, does not in itself constitute negligence, and finally the telephone company in this case should escape liability. Reference will be made to this controversy again.

Parsons v. Charleston Consolidated Railway, Gas and Electric Company et al, 48 S. E. 284.

HEARD ON THE PARTY LINE.

NOT THE RIG SHE WANTED.

People who call up police headquarters by mistake get answers occasionally that give them a momentary feeling of surprise, says a Grand Rapids paper, and their amazement is the cause of much hilarity among the bluecoats.

The other day a woman called up headquarters under the impression that she was talking to the liveryman who had charge of her horse.

'I want you to send the rig up right away," she said.

"Which one, the patrol or the ambulance?" inquired the chief, who was answering the telephone. The woman gasped and hung up the receiver.

* * *

BOLIVAR BROWN ON THE "TELEFONE."

The telefone are the instrumint what girls talks tu thayre felers ovir an men calls eche othir fightin naimes ovir. Tu wurk it you putt the receever tu yer ere an scowl an holler at a yung womin with a swete voice whu sets on a stule an shews gum in the sentral offus for soe much pir weke. Then you say, "Gimme numbir 285." "Tu ate five," she sez an then you jest wait. Purty sune you ring agin an this saim girl sez, "What numbir?" an it maikes you soer. You tel her agin an cuss an she sez yure no gentelmen. Aftir a while you git the numbir an find the persin you want tu speke tu ain't thare. Telefones are used by yure naybers tu git intu yure house an see what yure furniture luks lyke. Nevir use the telefone when lightnin are goin on less you want yer friends tu luk at you an say, "He luks lyke he's sleepin, doant he?" Wee have a telefone in our house which rings at 2 o'clock in the mornin. William Shakispere sed the telefone were a blessin, histery relaits, but my father, Willum Brown, sez it are a damoldnusance.

* * *

ONE WAS ENOUGH.

Excited Lady (at the telephone): "I want my husband at once."

Telephone Girl: "Number, please."

Excited Lady (snappishly): "How many do you think I've got, you impudent thing?"

* * *

TELEPHONE IMPUDENCE.

Stories of unusual nerve exhibited by users of telephones have been related almost without number, but the list is ever growing. The latest contribution is given by a Buffalo woman who recently had a telephone installed in her home. Every tinkle of the bell is quickly responded to, and she has not called herself a martyr when she has several times been requested to walk a block to deliver a free message. All this has been stopped, however, because of an experience, which she relates as follows:

"I was all alone in the house the other night, when at 2 o'clock I was awakened by the ringing of the telephone bell. At first I paid no attention to the call, but the ringing was insistent, so I finally answered. As I took down the receiver I was greeted with:

" 'Well, you were long enough getting there. I want you to step down the street to John B——'s house and tell him that I am going fishing to-morrow, and if he wants to go he will have to get the 5 a. m. train. Good-by.'

"John B—— lives down the dark street several houses away. It was dark and I hardly felt called upon to arouse the neighborhood at 2 in the morning by screaming to awaken him, so I went back to bed. The man who wanted the errand done I had never seen and I had never heard of. John B—— didn't go fishing.

"Some people appear to think that because you have a telephone in your house you ought to do the errands for the whole neighborhood and everyone else in town who wants an errand done in your neighborhood," said a woman who heard the above incident. "The other afternoon I had callers, and happened to be the only one in the house, as it was the maid's afternoon out and the children were away. The telephone bell rang, and I answered it. I was asked if I wouldn't step out and get a young woman who lives almost a block from my house to come to the telephone. I said I could not well do so at that time, unless it was a matter of great importance, as I was engaged. 'Well, it is important enough,' was the reply; 'but if you don't want to be accommodating you needn't go.' I didn't go. Afterward I heard that it was a young man who wanted to ask the girl to go to one of the parks that evening. I do not think he will ever call our house again, for I told him that I considered he was too impudent to oblige."

"He is not the only one in the city," replied another woman. "We have been compelled to have our telephone taken out simply because we were so constantly annoyed by people who wanted us to go out and get some one in the block to come to the telephone."

A Chicago man sued the Chicago Telephone Company for a nickel he had dropped into the slot of a telephone arrangement that did not work. He recovered his nickel, but the court costs were $7.70.

New Danger to Lead-Covered Aerial Cables

JOHN HESKETH

IN 1896 the attention of the writer was directed to perforations which had, in a few instances, been discovered in the sheathing of aerial lead-covered telephone cables in the Brisbane district. The perforations were not sufficiently frequent to make the question one of great moment at the time, but with the adoption of similar cables for use in other towns throughout Queensland the trouble increased and became of importance.

The cables in which the defects were found were of various kinds, the following being the chief types:

(1) Copper conductors, fibrous insulation, anti-induction leadfoil serving, lead-sheathed, and served with tarred tape.

(2) The same, but served with lead-painted tape.

(3) The same as in (1) but with the sheath composed of two layers of lead, a serving of Stockholm tar being placed between them.

(4) Paper insulated conductors, plain lead-covered.

These cables were all suspended in approximately similar manner from metal hangers on steel bearing-wires, the bearing-wires and sheath of the cables being connected with earth at each pole.

The holes found in the cable sheathing were of various sizes from 1 mm up to 6 mm diameter. They did not uniformly penetrate the lead, in some instances only entering to a depth of 1 or 2 mm while in others the perforations were complete. There did not appear to be any general damage to the adjoining portions of the cable; that is to say, the damage was confined to well-defined holes either partly or completely piercing the sheathing. A general gnawing of the cable was obtained only when the beetles were in confinement. Fig. 6 shows clearly the difference between the genral damage to the small lead-covered conductors by the beetle in confinement and the clear-cut hole in the larger lead sheath.

The small holes mentioned were found in the taped cables only, while the larger holes were found in all types. No cables so far used in Queensland have been immune, and the damage has occurred in Brisbane, Gympie, Toowoomba, Rockhampton, Charters Towers and Townsville. So far, however, plain lead-covered cables have been less subject to damage from insects than have the taped cables.

The trouble was as a rule made evident at the beginning of the rainy season in each year, say about November or December, and was commonly associated with the heavy thunderstorms which prevail about that time. The air then being saturated with moisture the insulation of the cable fell until the lines were often unworkable until the defects had been located and removed. The holes being so numerous this was often a matter of considerable trouble and time.

The disinclination to believe that an insect could cause the trouble delayed the solution of the question somewhat. Even in October, 1903, nearly two years after instructions had been issued for insects to be searched for, the belief was still held by some officers of the department that the smaller holes were caused by lightning.

The first evidence that insects were the cause of the trouble was found at Townsville in 1903, when the black Jesuit beetle was found in holes in the cable there. Very shortly afterward, very complete investigations carried out by Mr. F. Roseneder, telephone officer at Charters Towers, produced the evidence which is embodied herein.

The remedy usually applied when a fault developed in any cable was to have the cable dried out, either naturally or artificially, when the rain ceased, and then close the holes with solder. A remedy for the trouble as a whole has not yet been found.

As the question became one of importance it was referred to the Entomologist for the Queensland Department of Agriculture, Mr. H. Tryon, who wrote a most exhaustive supplementary paper upon it. This supplementary paper being deemed, however, too specially entomological for inclusion as a whole in these transactions, I have extracted fully from it and desire here to acknowledge my indebtedness to Mr. Tryon for his most valuable assistance in so special a subject.

Figs. 1 and 2 show the beetle Eceloncrus (order *Coleoptera,* family *Anthribidæ*) which had been provisionally associated with the beetle larva that undoubtedly traverses lead by gnawing a passage as it proceeds.

Fig. 3 is a drawing made by Mr. H. Tyron from completely dried-up samples of larvæ submitted to him.

The larvæ, at least when quite young, occur ensconced separately within oval egg-like objects that are attached to the surface of the substance within which they feed. These egg-like objects are outwardly rough and are almost identical in color with their immediate environment (e. g., blackish on tarred tape and gray on white-painted tape). They measure nearly 2 mm in length and 1 mm in breadth, their depth slightly exceeding their breadth. On the upper surface near one end of many of these objects is commonly present a small opening with jagged outline, though in some of the objects the opening is not present.

The face by which the object or shell is adherent is almost wholly removed or wanting, being eventually occupied by an oval opening corresponding in size and outline to that leading to a perforation in the cable.

The lead-boring habit of these larvæ was brought to light by Mr. F. Roseneder, Charters Towers, the original discoverer of the above-mentioned objects and of the grubs or larvæ associated with them. Mr. Roseneder not only found these grubs in the perforations whilst still in process of being made, but he transferred the grubs and their dwellings still attached to the tarred tape, to sections of lead sheathing which he could keep under observation, and he had the good fortune to witness in one instance the act of perforation being pursued by the grub and the method in lead tunneling that it adopted. The specimen so obtained is shown in the center of Fig. 1, where the "mullock-heap" of lead made by the grub can be clearly seen. The specimen from which the photos were taken is also exhibited.

The lead sheath that was perforated by these grubs was 2 mm in thickness. That attacked was invariably covered with tape that had been originally tarred or painted. Externally on this the cases were attached and the perforations were continuous through the tape into the lead sheath. The perforations were perpendicular in direction and extended in some cases partly, and in others wholly, through the lead sheathing. They were oval in section, the entrance and exits measuring about 2 mm in length and 1 mm in breadth. Where the perforations were incomplete, the bottoms of the

Paper read at International Electrical Congress, St. Louis.

holes exhibited fine linear gougings parallel and adjacent to each other. These gougings were in the direction of the longer axis of the oval cross section of the tunneling, and

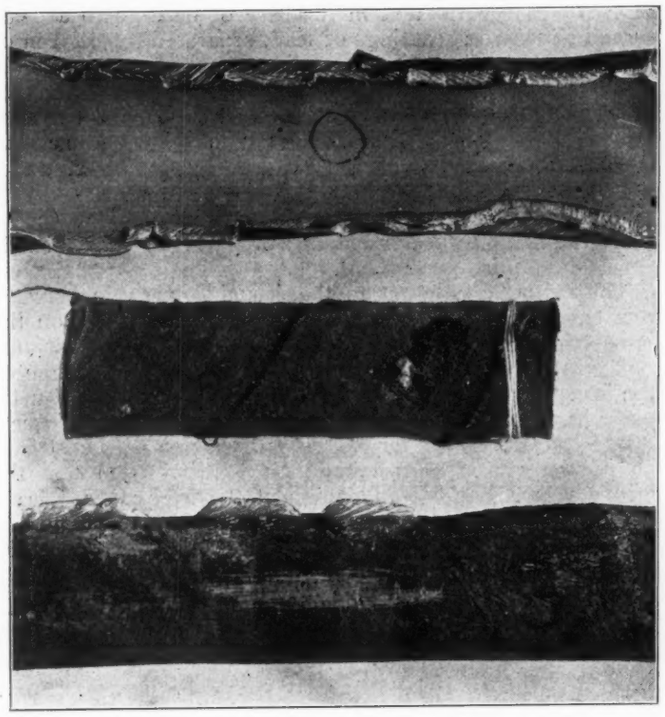


FIG. 1.—BORINGS (PERFORATIONS) BY "GRUB" OR LARVA OF BEETLE ECELONERUS SP. CHARTERS TOWERS.

View from within and from without, with grub in action. Only the light-spot represents scales of lead.

plainly revealed the nature of the implements, the insects' mandibles, used in their production.

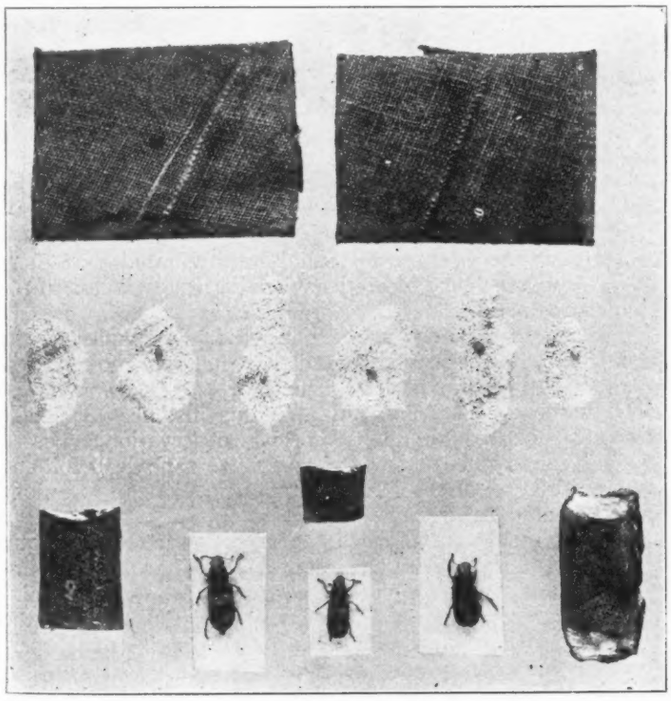


FIG. 2.—ECELONERUS BEETLE.

Three specimens. Larva case on, and perforations in, tarred parcelling; larva case on white-leaded parcelling; perforations in lead.

The usual habits of this grub are quite unknown. Mr. Roseneder used every effort to find the "cases" or shells associated with either trees or timber, but without avail.

Similar "cases" containing beetle grubs identical with those described have also been secured from Rockhampton, where they had been attached to the white-lead painted parceling of a cable. It is not, however, in evidence that the grubs proceeding from these cases had penetrated the subjacent cable. Indeed, the specimens suggest that they succumbed—possibly through taking the lead salt into their

FIG. 3.—ECELONERUS BEETLE.

system—prior to being able to bore into the lead sheath.

Mr. Tryon has discussed very carefully the question of the parentage of the grub under consideration, and in his paper already referred to gives the reasons leading him to associate the larva with an Anthribid beetle, and with Ecelonerus.

The perforations made by this grub are very numerous, as many as 14 holes having occurred in 16 inches. Being so small and being further covered by the "case" of the insect, they are difficult to find, and this may be regarded as the most serious part of the trouble.

The following table will give some idea as to the extent of the damage to the cables at Charters Towers. It shows the numbers of holes through the cable sheath in each span of each cable in February, 1904. The spans were about three chains long:

CABLES DAMAGED.

	Cable Number.															
	81	A81	42	37	13	10	5	29	A29	S60	W60	S66	N66	74	70	
Span 1...	0	0	3	12	1	43	2	4	5	6	2	17	6	10	0	
" 2...	0	0	4	10	0	34	5	2	5	16	0	10	1	14	0	
" 3...	6	0	3	15	4	10	9	3	4	20	0	.....	.....	7	0	
" 4...	3	0	22	16	14	81	..	1	2	2	0	.....	.....	0	0	
" 5...	0	0	0	8	1	8	..	1	1	7	1	.....	.....	4	1	
" 6...	9	0	4	15	12	3	..	..	.....	.....	.....	.....	.....	1	..	
" 7...	0	0	32	12	2	21	..	..	.....	.....	.....	.....	.....	6	..	
" 8...	11	0	19	6	3	13	..	..	.....	.....	.....	.....	.....	0	..	
" 9...	1	0	7	2	0	...	..	..	.....	.....	.....	.....	.....	0	..	
" 10...	1	0	0	0	1	...	..	..	.....	.....	.....	.....	.....	0	..	
" 11...	0	0	2	0	0	...	..	..	.....	.....	.....	.....	.....	..	..	
" 12...	0	0	0	1	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 13...	0	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 14...	12	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 15...	0	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 16...	1	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 17...	5	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 18...	1	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 19...	0	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 20...	0	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 21...	2	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 22...	1	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 23...	5	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 24 to	1	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
" 81...	0	....	..	..	..	...	..	..	.....	.....	.....	.....	.....	..	..	
Totals per cable...	59	0	96	97	38	213	16	11	17	51	3	27	7	42	1	

[NOTE.—The above represent the complete perforations. There were at least an equal number of holes which did not do more than just enter the sheathing.]

Fig. 4 shows the beetle Xylopertha (order *Coleoptera*, family *Bostychidæ*), of which four dead specimens were, in October, 1903, found in as many perforations met with

amongst numerous others that occurred in a lead-sheathed aerial telephone cable at Townsville. Mr. E. A. Towell, telephone officer at Townsville, collected these specimens and also observed a living specimen emerge from one such hole, proceed along the cable for about a foot and then return on its course. Forty such holes were found in one cable at

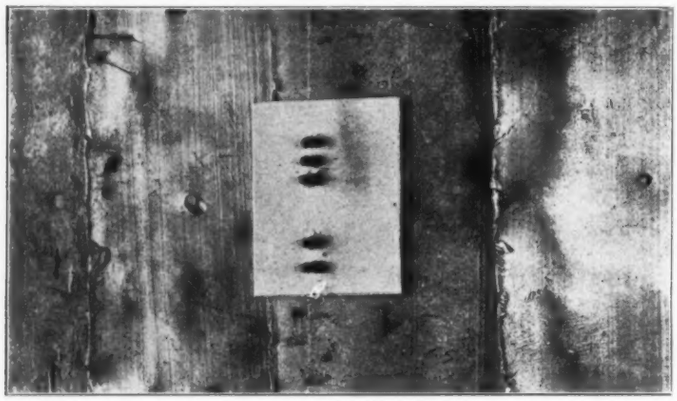


FIG. 4.—XYLOPERTHA BEETLES.

Perforations in lead; 1, 3 and 5, perforations viewed from outside; 2 and 4, from within sheathing.

Townsville. Of these six were examined and found to possess the following characteristics: The lead was 2 mm in thickness; the holes had sharp edges on both inner and outer surfaces of the sheathing, the holes being somewhat larger on the inner surfaces. Almost invariably they were shortly oval in outline and not spherical, and the major axis of the figure on the outer surface of the lead was usually transverse in direction to that on the inner, the former usually corresponding to the line of the cable.

In five cases the holes were almost perpendicular to the surface, in a sixth oblique. The openings to the five perforations presented the following measurements:

1. 2 mm. x 2.2 mm. and 2 mm. x 2.5 mm.
2. 2 mm. x 2 mm. and 2 mm. x 2.5 mm.
3. 2 mm. x 2.5 mm. and 3.5 mm. x 3.5 mm. (circular).
4. 1.2 mm. x 1.5 mm. and 1.7 mm. x 2.5 mm.
5. 1.7 mm. x 2.7 mm. and 3.5 mm. x 4 mm. nearly.

The walls of the perforations presented linear gougings such as might be produced by the mandibles of the insect under notice.

This species of Xylopertha is common and widely distrib-

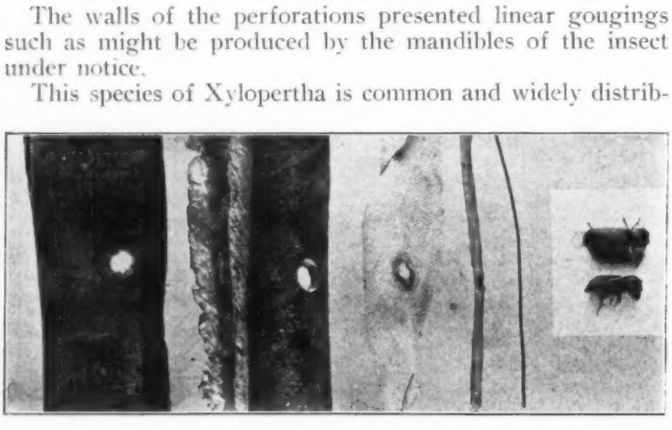


FIG. 5.—BOSTRYCHUS JESUITA. FABR. JESUIT BEETLE.

Perforations shown passing successively through tarred tape parcelling, lead sheathing, untarred tape surrounding conductors and metal foil covering of individual copper wire.

uted in Queensland, having been found as far west as Clermont and as far south as Brisbane. It feeds on wood (*Eucalyptus*) and bores into the hardest of Queensland hardwoods. At the time the damage was done to the cables in Townsville, the beetle was very numerous there and dozens of holes that had been made by it were found in telephone poles.

It has been found that wood painted with tar, and to a less extent with ordinary paint, escapes the attack of this insect. Mr. Towell reports that in the case of damage to a cable served with two sheathings of lead, separated by a dozen of Stockholm tar, the perforations did not extend through both. Instances have, however, since occurred where the perforations have extended through both lead sheaths and the intervening coating of Stockholm tar in such a cable, but whether the perforations were caused by the insect under notice or by another I cannot say.

Fig. 5 shows the beetle Bostrichus Jesuita, Fabr. (order *Coleoptera*, family *Bostrychidæ*), or Jesuit beetle, which is very common in Queensland.

The evidence pointing to the casual connection between this beetle and the perforation in the metal shown on the same photo is of a circumstantial character. The perforation corresponds in size to that required for the passage of the insect, and in this and other respects to bores habitually made in wood by the same beetle. Moreover, of five insects found by Mr. Roseneder within a day or so of each other, all were captured at the time (November, 1903) that the injury was remarked, and amongst the lead-covered leads at the place where the injury occurred. Further, not only was no other beetle found there and then to which the work

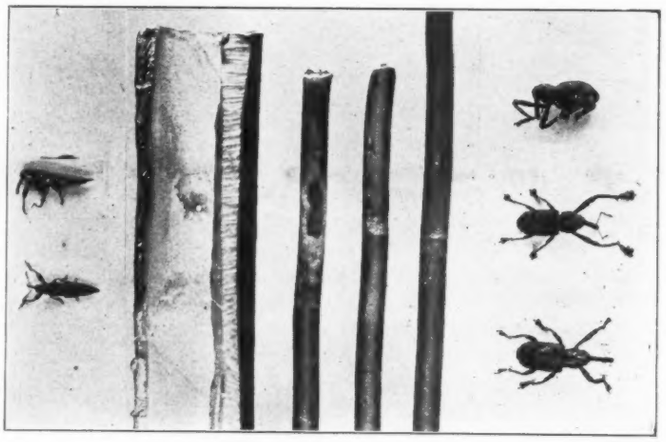


FIG. 6.—ORTHORRHINUS CYLINDRIROSTRIS. FABR.

A lead-gnawing beetle; males and females. Lead-covered conductors, illustrating its gnawing habits. Lead sheathing with perforations probably made by it. *Belus Sp.* (2) Found to gnaw in confinement.

of forming the perforation could be attributed, but there was an entire absence of beetles other than individuals of the kind under notice.

Further, the writer, on confining living examples of the Jesuit beetle without food, found that they had most clearly marked with their mandibles a piece of lead that was accessible to them. The perforation in this instance (which is the only one so far under special observation) passed through the tarred tape, lead sheath, inner tape, lead foil and paper insulation of the conductor, but no damage was done to the conductor.

On the outside of the lead the perforation measured 8 mm x 7 mm, but on the inside it was nearly circular with a diameter of 7 mm. The walls of the perforation show very plainly gougings corresponding in character to those due to the action of cutting insect mandibles. The margins of the perforations were sharp and irregularly jagged.

This insect is found both in New South Wales and Queensland, in the latter state being distributed widely from the western border right through to the eastern seaboard. It is met with boring in or out of various kinds of trees, principally those belonging to the genus Eucalyptus.

Fig. 6 shows the Elephant beetle *(Orthorrhinus Cylindrirostris* Fabr; order *Coleoptera,* family *Curculionidæ)* and the damage caused by it. When in confinement this beetle has gnawed the lead from covered wires as shown in the illustration. Mr. Roseneder has also remarked clear-cut holes in the lead sheathing of the telephone cables not corresponding to those made by any other insect that at Charters Towers similarly attacks this substance.

A specimen examined shows a perforation which is found to bear the same relation in size to the average width of the proboscis of the female insect, as is shown by holes in wood that have been made by it when placing its egg therein.

The lead sheath was 3 mm in thickness and the perforation circular of a diameter of 1.5 mm. The walls of the perforation exhibited gougings which were for the most part circumferentially directed.

The insect when it gnaws away the bark of trees only injures the wood by piercing it with its proboscis, and then only for the purpose of placing its egg there, and of ascertaining the suitability of the wood for that purpose.

Fig. 7 represents the only instance of the damage to lead-covered wires by this caterpillar *(Xyleutes, Boisduvali.*

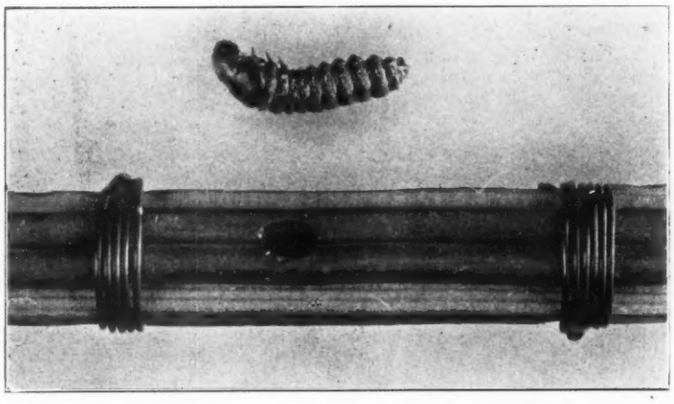


FIG. 7.—XYLEUTES BOISDUVALI. ROTSCH. (ORDER LEPIDOPTERA.)

Partially grown caterpillar and hole through conjoined lead-covered conductors made by it in effecting exit from telegraph pole.

Rotsch; order *Lepidoptera,* family, *Cassidæ)* that has so far come under notice.

This instance was brought under the notice of the writer by Mr. Curtin, an officer of the engineering branch of the Queensland telegraph service, as having occurred at Toowoomba. The work was effected by the partially grown caterpillar which, finding the wood in which it dwelt becoming dry, proceeded to gnaw its way out in order that it might acquire more congenial quarters. In doing so it was impeded by two lead-covered conductors (placed up the pole to connect a cable with the aerial lines on the pole) and gnawed a hole nearly a quarter of an inch in diameter through the lead, but was discovered prior to effecting its escape.

Such an incident must be regarded as a highly-exceptional occurrence and not likely to recur.

Since the above paper was written the attention of the writer has been directed to an article in which mention is made of somewhat similar damage which has been found at Shanghai, and which is reported to be caused by wasps. As no description of the wasp is given, it is impossible to make any comparison between it and the insects described herein. The damage to the cable in Shanghai does not, however, bear any marked resemblance to that which is the subject of this paper, but appears to be somewhat similar to the damage effected by the Elephant beetle when in confinement. (See Fig. 6.)

STUDY OF TELEPHONE VOICES.

Your voice tells your character—at least, that is the verdict of the experienced telephone operator.

"I have a friend," said a telephone girl, "who was chief operator for a certain company. She always declared that she could tell not only the disposition of the person telephoning, but that she could also describe his appearance with scarcely an error. A man she had never met heard of this, and, to test her, telephoned:

" 'Miss B——, I hear that you say you can tell what a man looks like by his voice. What do I look like?'

"I know it sounds incredible, but that girl described him almost as well as though she could see him. Not all of us can do that, but as a rule we can tell what sort of a disposition the one telephoning has. If you would take the board for an hour yourself I think you might have a similar experience. Of course, we at the board all the time feel the personality of people as soon as they speak—we can't help it."

Another "hello" girl remarked:

"Customers always feel the effect of our voices on them whether they speak of it or not. That is why operators with sweet voices do not stay on the force long—they get married. I think if some men could hear their wives' voices over the telephone the way we do, before their marriages, they would never sign the contract. It is amusing, sometimes, to hear the way the tone changes the happy event. Men are as bad as women for that. But the thing I began to say is that an operator's voice can stir a man to anger—the mere tone—yet few people ever think how their voices may affect the operator. She listens to thousands of voices in a day, one after the other, all keyed to a different tune. You can imagine what that means.

"We can tell over the telephone whether you are happy, or sick, or selfish, or thoughtless, or nervous; whether you are angry with the one whose number you wish, or whether you are about to ask a favor. Of course we do not always have time to think these impressions out in coherent form, but they are there, just the same."

"What is the most unpleasant voice?" repeated another telephone girl. "I think you will find that most of us agree that there are three unpleasant to deal with—the abrupt, the high, knife-like soprano and the hesitating. The first indicates nothing but absorption in business, or impatience, sometimes natural, and sometimes of the moment. It never fails to 'rattle' the operator. Many times, when I have been all ready to tell the number, an abrupt request would scare it out of my head. The woman with the high voice who speaks too loud gets on the nerves most. An operator should have no nerves."

When asked which voices were pleasantest over the telephone as a rule, man's or woman's, they responded in unison, "Men's." This is perhaps not strange, since they are all girls. However, there is another reason for this. Women's voices are apt to be metallic over the telephone, not a pleasant sound, and there are more women than men who talk too loudly. A man will often be courteous where a woman is not. That does not mean that men do not speak for their rights. There are ways and ways, and voices as well as ways.

Sometimes voices deceive even the experienced. That is the case where really pleasant people have voices which sound gruff and abrupt over the wire. There is one thing that the voice always indicates, whether soft or hard, and that is, in general, the "backbone" of the person speaking.

Three police telephones have been placed along a highway near Lawrence, Long Island, for the purpose of reporting the speed of automobiles. If the speed limit is exceeded when passing the first station, the driver is arrested at the other end.

Conventions of Independents

NORTHEASTERN IOWA TELEPHONE ASSOCIATION MEETING.

THE fifth semi-annual meeting of the Northeastern Iowa Telephone Association was held in the parlors of the Gedney Hotel, at Independence, Iowa, on Thursday and Friday, September 8 and 9. Twenty-five Independent telephone companies comprise the membership of the association, all of which were represented at this meeting. The meeting was called to order by President Stevens and the following programme was given at the sessions, Thursday and Friday, each paper being succeeded by very interesting discussions:

"The Situation in Our Neck o' the Woods," O. F. Blazin, Rockford.

"Are Our Relations with the Farmers Improving?" A. H. McClun, West Liberty.

"The Advantages of a More Compact Organization," E. C. Hampton, Marion.

"Needed Legislation," S. J. Elgin, Monticello.

"Long Distance Lines," G. Hauck, Belleview.

Friday morning after the regular session, George T. Hewes of the Sioux City Telephone Company read a paper on the subject, "A Natural Monopoly," which was one of the best addresses of the session and follows in full:

Standard Dictionary definition:

MONOPOLY. "The exclusive right, power or privilege in a particular traffic or business, or the resulting absolute possession or control, especially in political economy; such control of a special thing as a commodity enables the person or persons exercising it to raise the price of it above the price it would bring under competition."

NATURAL. "Of or pertaining to one's nature; belonging to nature or constitution; not foreign or acquired; originally or inherently characteristic." "(7) Connected by ties of consanguinity, being such by birth, etc."

The Bell Telephone Company would have you believe that the correct definition of the combination of these words implies that by virtue of the fact, through the protection of the patent laws, they have enjoyed an exclusive monopoly, and are still entitled to continue an exclusive monopoly of the telephone business. Our government, desirous of rewarding genius, has wisely afforded protection by her patent department, and, while seventeen years is the limit, we are most of us familiar with the subterfuges practiced by the Bell company to prolong the period of protection.

We often see the statement that the telephone business is a "natural monopoly." Every time we see this we can put it down as being a paid article, at the expense of the Bell company and the public, should they believe it. How egotistical it would appear if a certain manufacturer of a steam engine should say: "I have a 'natural monopoly' of the methods of utilizing steam for generating power"; for the Standard Oil Company to say: "Thou shalt not burn oil except that which has been refined by me and bears my stamp"; or for a preacher of any particular religious denomination to say: "My creed is the only method of salvation."

Such expressions are only made by those who would deceive you, and their utterance gives index to their selfish designs.

It is against public policy to encourage the monopoly or exclusive control of the necessities of life. The use of the telephone is fast becoming recognized as a necessity through the instrumentality of the Independent movement. During the monopoly of the field by the Bell company the telephone was a luxury which only the few could enjoy. There are restrictions which should govern public carriers of every character. Local conditions are the best criterion by which restrictions should be measured. A universal telephone rate for exchange service throughout the length and breadth of this land could not be adopted, for the necessities of intercommunication are not of the same character in Alaska as in Nebraska, nor would the expense of furnishing the means be the same in each case.

Persons engaged in the generating of electricity for lighting purposes endeavored to govern the selling price of their commodity by the prices charged in other communities, but soon found that the price should be regulated by the cost of the different elements which enter into its manufacture. This is true of the sale of gas, pumping of water and all other public utilities. If by the utilization of modern scientific methods we are enabled to manufacture or furnish public necessities at a reduced cost to the consumer, why should not we be permitted to do so and thereby benefit the public at large?

The old theory held by many Independents that the greater the number of telephone subscribers operated by one exchange the less the cost per subscriber, has long been proven a fallacy. The Bell company had learned this from actual experience and has been waiting for the Independents to learn also, but through the medium of the automatic exchange our fondest hopes have been realized and the theory of long ago is now an established fact. Independent telephone interests and the public at large welcome with outstretched hands the universal adoption of automatics. We all well know the advantage to the public of the automatic machine, the linotype, by which means we are enabled to purchase a newspaper for one cent or an encyclopedia for ten dollars.

The methods and apparatus of the Bell company of to-day are obsolete, and they are beginning to replace their magneto system and aerial wires by central energy and underground construction, which never would have been done had not the competition of the Independent movement compelled them to do so. The public demand better and more service and they are becoming rapidly educated through the Independent telephone industries, both by manufacturers through their literature and operators by their improved service.

"He who causes two blades of grass to grow where one formerly grew is performing a duty which he owes to his creator and fellowmen." He who causes three telephones to be used where one formerly was used should receive the approbation of mankind.

Mr. Hewes also talked on the new automatic system which is being installed at Sioux City.

The regular business meeting of the association is held each year in February, at which time the election of officers takes place. The meeting adjourned Friday noon. Following is a list of the present officers:

President—Victor Stevens, Dubuque.
Vice-President—J. F. Van Voss, Independence.
Secretary-Treasurer—S. S. Lichty, Vinton.

DISTRICT MEETINGS IN OHIO.

The district meetings of the Ohio Independent Telephone Association in the various parts of the state were marked with much interest. J. B. Hoge of Cleveland, F. L. Beam of Columbus and a number of other prominent telephone men have attended most of them and made addresses. The result is that the district organization is very complete and the association is now in position to begin to reap some of the benefits of uniform action and uniform operation and management. Should the plan of organization adopted in Ohio be carried to other states and to the national organization, such a general understanding will be had of the Independent movement that the companies will be able to operate almost as one great organization. While the association will pay some attention to the competition of the Bell people, its primary purpose is for the betterment of the Independent movement.

Meeting of District No. 8 at Lima on August 18 was attended by about fifty delegates. President Beam of the state association was also in attendance. The meeting was presided over by George H. Metheany, vice-president of the district. J. B. Hoge, secretary of the United States Telephone Company of Cleveland, outlined the action that should be taken to obtain the results aimed at by the state organization. David Clark of St. Marys was elected secretary. The district comprises Allen, Auglaize, Hardin, Hancock, Wyandot, Marion, Paulding, Van Wert, Putnam and Mercer counties.

District No. 6 of the Ohio Independent Telephone Association met in Dayton August 23, at the office of the Home Telephone Company. Representatives of Independent telephone exchanges in Montgomery, Greene, Clarke, Champaign, Logan, Shelby, Darke, Miami and Madison counties

were present and the meeting was an enthusiastic one. Matters pertaining to Independent interests were discussed and the organization of the district completed.

Meeting of District No. 5 was held in Hamilton August 24. The purpose of the meeting was to adjust all business differences and effect a more perfect system of co-operation. Managers of Independent lines in Butler, Preble, Warren, Claremont and Brown counties attended. There were about thirty delegates present and delegates were appointed to attend the state convention. The question of long distance service was thoroughly discussed and arrangements were completed with the United States Telephone Company for connections in Ohio, Indiana and Michigan. This new arrangement will give the Hamilton company perfect long distance service.

Meeting of District No. 9 of the Ohio Independent Telephone Association was held in Columbus August 25 for the purpose of further perfecting the organization. Addresses were made by Frank L. Beam, president of the state association; J. C. Weaver of Dayton, and others. The meeting was presided over by Dwight E. Sapp, vice-president, and much enthusiasm was manifested by those present, many of whom were bankers, professional and business men interested in the companies. An effort was made to bring into closer relations the various exchange companies and to establish a standard in the methods of business in order that the companies in the state, which control 180,000 telephones and $130,000,000 capital, might act in unison.

Meeting of District No. 3 at Zanesville August 31 was especially well attended—sixty-five delegates being present—and much good was accomplished. J. B. Rhodes, secretary and general manager of the Zanesville Independent Telephone Company, is vice-president of the third district. He made a short address in which he stated that much good had been accomplished. A more uniform rate and operation had been secured and a closer fellowship was sure to result. Mr. Rhodes also stated the counties included in his district are ahead of many other districts in the state in the way of operations and service. The meeting was presided over by Vice-President Rhodes, and was largely devoted to talking over the situation and perfecting plans for a closer federation. Among the speakers were: James B. Hoge, C. Y. McVey and M. V. Overly, Cleveland; F. L. Beam, Columbus; S. C. Kissner, Coshocton; P. E. Farley, Woodsville, and A. H. Doudna, Bridgeport. H. W. McKee of Cumberland was elected permanent secretary.

Meeting of District No. 2 was held at Canton on September 1. Thirty telephone companies were represented by sixty delegates. General reports from all present showed that the companies included in this district were in a very prosperous condition and in a position to do some aggressive work in the future. The meeting was held at Hotel McKinley and was presided over by W. F. Laubach. A temporary secretary was elected, after which some brief remarks upon the purpose of the organization were made by the vice-president. Other addresses were made by F. L. Beam, president of the state association; J. B. Hoge, Ed. L. Barber, Hon. Cyrus Huling, H. L. Beatty, and by managers of various companies. An executive committee was then appointed, after which a general debate took place upon the developments of the territory, extent of systems and also relative to cases of grievances which should be reported to the executive committee. Reports incidentally brought forth the fact that the number of Independent telephones outranks the Bell by a ratio of eight to one in the district. New companies are being organized and the interest in the work on hand has grown with great rapidity, new impetus having been given by the formation of the association. Delegates to the state convention at Columbus were elected.

A meeting of representatives of the eight telephone companies of Preble county, Ohio, held lately in Eaton, Ohio, resulted in formal action being taken toward the forming of a general organization, whose object will be to increase the efficiency of county telephone service; mutual assistance in settling disputes in regard to territorial rights of individual companies, and to establish a uniform toll schedule. A code of laws to govern the new organization will be prepared by the following representatives of interested companies: S. C. Morton, Camden; W. D. Rush, George Cook, Morning Sun; C. D. Fudge and L. D. Lesch, Eaton. The action of the company is especially significant because of the absence of a precedent.

PENNSYLVANIA INDEPENDENTS ORGANIZE.

A largely attended and enthusiastic convention of all the Independent telephone companies of Pennsylvania was held in Harrisburg, September 27 and 28, at which a permanent state organization was effected. Plans were also discussed relating to the interchange of business that will give each company the advantage of long distance service. The companies in attendance covered every section of the state.

The following companies signed the original call for a convention: Keystone, Philadelphia; Mutual and Union, Erie; Pittsburg & Allegheny, Pittsburg; Maryland, Pennsylvania & West Virginia, Uniontown; Consolidated, Scranton; York, York; United, Philadelphia; Bradford, Towanda; Cumberland Valley, Harrisburg; Elk, Ridgway; Huntingdon & Clearfield, Clearfield; Pittsburg-Johnstown, Johnstown; Pittsburg-Wheeling, and Pittsburg-Butler, Pittsburg.

The meeting at which it was decided to send out the call was held at Philadelphia, September 8. Among those present were: John M. Mack, C. E. Wilson, W. B. Tresk, E. D. Schade, William Spencer, J. G. Splane, R. E. Umbel, Samuel E. Wayland, George B. Rudy, D. F. Lafene, W. D Barnard, H. E. Bradley, B. F. Myers and William Flynn.

There are said to be in operation in Pennsylvania at the present time fully 100,000 Independent telephones. A consolidation of interests is talked of in the near future by which it is planned to perfect the long distance service throughout Pennsylvania and into adjoining states.

NORTH DAKOTA MEETING.

Fargo will be the scene of the next meeting of the electric and telephone men of North Dakota, the gathering to take place in October. The officers of the organization are: President, J. F. Leary, Valley City; vice-president, Allen Tompkins, Rugby; secretary, J. S. Fuller, Larimore; treasurer, Thomas Roycroft, Grand Forks. The organization includes almost all the Independent telephone companies in the state and has a large membership of practical telephone men who are enthusiastic over the showing made by their companies since the association has been formed. The Independent movement in North Dakota has assumed large proportions and it is expected that this meeting will be an important one.

INDEPENDENT TELEPHONE ASSOCIATION OF SOUTHERN INDIANA.

The annual meeting of the Independent Telephone Association of Southern Indiana was held at Rockport, Indiana, September 26 and 27. There was a large attendance and great interest was manifested in the addresses and all the deliberations of the convention. Business of importance was transacted and reports from all sections showed the Independent movement in southern Indiana to be rapidly gaining and keeping step with the progress being made elsewhere in the middle west.

KENTUCKY CONVENTION POSTPONED.

The annual meeting of the Kentucky Independent Telephone Association has been postponed from October 11 to some date in November, to be decided upon later.

Telephone, Telegraph and Cable in War

COL. SAMUEL REBER, U. S. ARMY

"WAR," says Von Moltke, "is the only science that lays under tribute all the other sciences." The great discoveries and advances in science made during the past century have been utilized in the art of war, and none, with the possible exception of steam, has produced a greater change in the application of its principles than the use of electrical means of communication. The saving of time, and subsequently money, by the use of the telegraph, the telephone and the cable in the affairs of daily life has been beyond calculation. The use of electrical means of communication is now absolutely necessary to success in war, not only in the grand strategical combinations of a campaign, but also in the varying tactical situations on the field of battle.

The element of time is one of the dominating factors in modern warfare involving enormous expense incident to the equipment, maintenance, supply and movement of large fleets and armies. The longer the duration of a war, the greater the strain on the physical and financial resources of the nations involved. The ultimate result of a war may depend on the financial capacity of a nation to pay, feed and supply a victorious army. War disturbs not only the normal internal conditions of belligerent nations, unsettles and frequently paralyzes their trade, industrial and agricultural prosperity, but also produces a far-reaching result on the commerce of the world.

Nations are now so intimately connected by business and fiscal ties that the effects of a war are quickly felt in the markets of the world. Although business may be stimulated for a while by a war, the ultimate effect must be one of depression. The exhaustion of the resources of one of the family of nations, caused by a protracted war, is felt to a greater or less degree by all the others. Anything which tends to shorten the duration and limit the sphere of a war is a decided gain, not only to the belligerents involved, but to the world at large. Electricity with its space and time-annihilating properties has proved an ideal agent in shortening the duration of wars.

Napoleon in one of his maxims of war has said: "Le secret de la guerre est dans le secret des communications." It is absolutely necessary for the commander of an army to have rapid and positive means of communication for the transmission of orders, instructions and information from his extreme outposts in contact with the enemy back to his base in the rear of his army, and with all independent commands engaged in the theater of operations.

The development of the use of the telegraph, telephone and cable in war has been along lines similar to those of commercial practice. The engineering principles are the same, but the operative conditions are, of necessity, more exacting and difficult. Efficiency and certainty of operation under all conditions are the fundamental principles governing design. Cost of installation and economy of operation are of less importance than absolute continuity of service. It is not to be understood, however, that due regard should not be paid to cost of installation and maintenance, but commercial methods fail under the stress of war conditions. A large number of ingenious methods and apparatus have failed on account of delicacy of operation or complication of design. Any apparatus that cannot stand lack of attention and skilled supervision, exposure to weather, rough handling in transportation, and the effect of the blast of heavy guns, cannot be relied on at the critical moment of its use in actual battle. Portability, simplicity and mechanical strength are essential requisites of all the apparatus used in the service of field communication. The demands of a fortress system of communication are not as exacting, while the installation and operation of military cables follows the commercial practice of the nations using them.

It is impossible in the scope of a single paper to give the characteristic features of the systems and apparatus employed by the various nations for military purposes, or the organizations of their special technical troops. With the exception of the United States, all the great military powers of the world control the service of electrical communication in time of peace as part of their civil establishment. Experience has proved that in time of war, and especially in the field of active operations, this service must be part of the military establishment. All the great nations have special technically trained troops to operate their military systems. The operation of a system by joint civil and military control has proved a failure in the past, and the experiment will probably never be repeated.

The service of communication is, in general, separated into field and fortress work. The fortress system consists of the permanent lines, usually underground, connecting the various works in the line of circumvallation around fortified positions, and in seacoast works, the system of fire control and direction for the laying and training of the heavy batteries, rapid-fire guns protecting the mine fields, and the searchlights. The details of such systems are zealously preserved as governmental secrets for obvious military reasons. For armies operating in the field a complete chain of communication should exist, from the outposts in touch with the enemy back to the capital of the nation, or the main base of operations, which is connected to the seat of government by permanent lines. In case of over-sea operations the base is connected by cable.

Depending on the construction used, the chain of communication is usually divided into three parts—permanent, semi-permanent and temporary, or flying lines. Permanent lines are usually those existing in the country or are built after the army has advanced. They are ordinarily outside of the zone of active operations, their construction following the usual engineering methods. When taken possession of and operated by the army the methods used are those of established commercial practice. Semi-permanent lines are used to connect the principal bases or depots of supplies on the edge of the zone of operations with the field bases within it, and the general headquarters. Field or flying lines are used in the zone of active operations and connect the general headquarters with all the principal subdivisions, even to the extreme outposts. In this service expedients of rapid construction of every nature are employed, and the telephone is fully utilized. It is possible to construct a line, using lances of ash or bamboo to support the wire, at the rate of from one to three miles an hour, depending on the character of the ground. By the use of light field cable and bare wire a detached cavalry column, or even a reconnoitering party, can be connected during its movement with the main body. At night each brigade and division headquarters can be connected by a field telephone system with the corps headquarters and the supply points, while the extreme outposts can instantly report any movements on the front. On the field of battle the commanding general can be connected telephonically with his corps commanders, and they in turn with their division and brigade commanders.

Major Von Etzel, of the Prussian army, first suggested in 1839 to the War Department the possibility of employing the electrical telegraph, but it was not until 1844 that a

Paper read at International Electrcal Congress, St. Louis.

board of officers was convened to consider this subject, and not for several years subsequent to that date was the necessary material obtained and a line built. There is no record of the result of this experiment.

In 1853, during the maneuvers of the Austrian army at Olmütz, a movable telegraph line was constructed by stationing men at intervals to hold light lances to support the wire. Naturally the result was not considered successful.

The first practical application of the telegraph was during the siege of Sevastopol by the allied armies in 1855, where the searchlight was also first tried, the current for the arc being supplied by primary batteries. The dynamo was not used in searchlight work until the siege of Paris in 1871, where it was employed by the Germans, the French using primary batteries for the arc. During the siege of Sevastopol the lines were of permanent character and were not used for tactical purposes.

From 1854 to 1856 the Prussians again took up the telegraph for war purposes, but limited its scope to permanent lines. They did not contemplate its use in following the movement of troops, or on the field of battle, where it was first used by the Federal forces at the battle of Fredericksburg in 1863.

During the great Indian mutiny, field telegraph lines were constructed connecting the column in the field with the seat of government in Calcutta. Uninsulated iron wire circuits suspended from trees, bamboo lances or even laid on the ground, were worked for a distance of 100 miles, although in the rainy season communication was frequently entirely interrupted.

In 1857, during the French operations in Algiers, the telegraph line was operated by civilians, the wire being suspended from trees. During the same year a school of instruction for military telegraphers was established by the English at Chatham.

Spain in 1859 organized and maintained in the Morocco war the first properly equipped and efficiently manned field telegraph train, using insulated wire coiled on reels and arranged for pack transportation, the instruments employed being Morse printing registers.

During the Franco-Austrian war in 1859 in Italy, the civilian employes of the state telegraph service operated the military system, which was maintained by peasant labor requisitioned from the inhabitants living in the zone of operations. This method of operation proved decidedly unsatisfactory, and the necessity for a military personnel and improved material was first recognized. During this campaign we find the first example of communication with the home government from the field of operations by telegraph, and the transmission of orders from the commanding general to both the front and flanks of the French army.

The Italian army in 1861 gave the first example of the value of continuous communication between parallel moving columns separated by a mountain range. The two army corps starting from different points marched to concentrate at Ancona, and although separated by the Appennine mountains, were in constant communication with each other by lines that were built by and kept pace with the troops. Copper wire suspended by insulators on light poles were used. In front of Ancona the fleet, the front and flanks of the army, and the general headquarters were connected together by a system of field telegraph and semaphores.

In the Civil War in the United States in 1861-65, the telegraph was considered indispensable, and was employed on a greater scale than ever before attempted or since reached. The results obtained awakened anew the interest of the great military powers in the development and equipment of their field organizations. For a while in the beginning of the war magneto instruments were employed, but they were soon replaced by Morse sounders. Over 15,000 miles of line—land, submarine and field—were constructed. For the first time in the history of war the telegraph was used on the field of battle in the several encounters in the peninsular campaign and at Fredericksburg. General Grant, from his headquarters on the Rappahannock and at City Point, controlled and directed the movements of over 600,000 men in 18 separate armies maneuvering in a theater of operations that contained 800,000 square miles of territory.

It has been said that strategy is a fixed science and that wars during all ages have been conducted on the same strategical principles. The factors in the problems of strategy have been greatly influenced by improved methods of communication, and while the abstract principles have remained the same, the means of employing them have been greatly improved. Strategical combinations which were impossible at the beginning of the nineteenth century are now of frequent occurrence. Sherman's march to the sea compared with Napoleon's campaign of 1812 exemplifies this change. Napoleon early in 1812 made up his mind to invade Russia, but owing to the poor means of communication was unable to concentrate a force of 500,000 men and enter Russia from Poland until the last part of June. After 84 days and a very costly battle he entered Moscow. The country having been laid waste, the Russians retreated to St. Petersburg after having burnt Moscow, and a severe winter coming on, he retreated, losing 450,000 men. His downfall dates from this disastrous campaign. In 1864 Sherman began his advance into Georgia with 100,000 men in the early part of May. After continuous fighting for three months he entered Atlanta. His enemy had not been destroyed but fell back and began very active operations against his communications. He immediately communicated with the commanding general, some 1,500 miles away, by wire, and arranged with him to march to the sea where supplies should be provided. Having reached the sea, he proceeded northward against the line of retreat of the main army of the enemy in Virginia. After having made a march of about 1,000 miles through the enemy's country, he materially aided in the final destruction of the Southern armies. These are the two longest marches in the campaigns of recent time, the one disastrous, the other highly successful. The failure in the one case was due to the lack of communications, the success of the other to their existence and utilization. "What was false strategy—because impossible—in 1812 was good strategy in 1864."

In the five years' war between Brazil and Paraguay in 1864-69, the telegraph was of great value not only in connecting the permanent works, but also detachments from the main armies and outposts. It was successfully used at the siege of Humaita.

During the six weeks' war in Bohemia the telegraph was only utilized to a limited extent owing to the contracted front of the theater of operations and the undeveloped stage of apparatus and material. No lines constructed were of greater length than 10 miles, as the permanent telegraph systems of the country could always be reached within that distance. Light field cables of the Siemens type were first used in this campaign, during which the headquarters of the three Prussian armies were connected by wire with the general headquarters of the king and the capital at Berlin. The working of the organization was not very satisfactory for strategical purposes. The personnel and material were unsuited for tactical use.

France did not, until 1868, establish any definite military system, although a number of experiments had been made for a series of years, when a military telegraph organization was adopted. This organization does not appear to have worked in a satisfactory manner during the Franco-Prussian war and fell into the hands of the Germans at the capitulation of Metz. The Germans employed the telegraph extensively during the war, its use contributing in a marked degree to their success. Their three armies were connected to their bases and the home government. At Strassburg the telegraph line was carried to the third parallel, and was

of great assistance in directing the artillery fire. The siege of Paris would probably not have been successful without the use of the telegraph, for the lines of investment were 46 miles in length with about 4,000 men per mile, the besiegers being less numerous than the besieged. During the three days' fight on the Lisaine where Von Worder, who was covering the siege of Belfort, was attacked by Bourbaki, it was due to the thorough telegraphic communication which had been established by the Germans that the timely arrival of the reserves from the extreme right was effected, as was their subsequent return there at a critical moment. At the close of the war the Prussians had in operation 6,730 miles of field wire with 407 stations.

The military system of Spain which had been developed during the Morocco war had been improved. At the battle of Alcoba, the Spanish commander was in constant communication with Madrid, and the field telegraph was an indispensable aid to General Prim in putting down the Republican and Carlist insurrections. During the Civil War in 1873 the field telegraph was in constant use, and in the defense of Bilboa the weak garrison was enabled to hold the extensive works by concentration ordered by telegraph at the threatened points.

During the Turko-Russian war the Turks had no special field telegraph corps, although some permanent lines were built for military purposes. The Russians, however, used field and outpost telegraphs extensively, constructing 1,344 versts of line in the Balkan Peninsula and 1,034 versts during the Asiatic campaign. The following incident in the Asiatic campaign is an example of its value to the Russians: In the operations in the Kurukdere mountains against Mukhtar Pasha, General Lazereff was ordered to march around the Turkish right, passing along its rear and cutting Mukhtar's force off from Kars and placing him between the two Russian forces. After severe fighting Lazereff obtained possession of Mount Oghur, a strongly fortified point which connected the Pasha with Kars. From this point Lazereff telegraphed the Grand Duke over the field line, which had kept pace with his movements, that he was confronted by a superior force and a simultaneous attack by the Grand Duke's and his own troops was needed to extricate him from his critical position. The dispatch reached the Grand Duke in such time that the simultaneous attack the following morning led to the total destruction of the Turkish army.

The development of the military telegraph system of the English army appears to have progressed quite slowly at first, as its importance does not seem to have been recognized by the authorities. When the Ashantee war of 1873 broke out no field telegraph material existed in the army, and none reached the troops in the field until they were well into the interior. When the supplies were received they were both insufficient and unsuitable, but assisted in hastening the termination of the war. Again in the Zulu war in 1879, no provision seems to have been made at the beginning of the campaign. Better use of the telegraph was made in the Afghan campaign of that same year in the face of great difficulties of operation caused by the constant cutting of the lines by the enemy.

In 1881, Major Cardew introduced the telephone as a receiver for telegraph purposes, using a buzzing note produced by an interrupted current for transmitting Morse characters. This system has been modified and extensively used with great success in our own service. The buzzer, as it is called, is simply a coil of low resistance and high self-induction in circuit with a telegraph key, an interrupter and a few cells of dry battery. On opening the circuit the discharge from the coil goes to the line, and owing to the high self-induction and consequent comparatively high e.m.f., enough current reaches the other end of the line to give audible signals. By the use of the buzzer leaky and broken lines which would be absolutely grounded for ordinary Morse working can be operated. Major Cardew's system was first used in the Egyptian campaign of 1882. The telegram announcing the result of Tel-el-Kebir was sent from the battlefield by this system. Profiting by their previous experiences, about which an English writer of high authority in 1894 naively said: "Some ill-luck seems to have attended our telegraph arrangements on service," the British had a completely equipped and supplied telegraph organization in the field during the recent Boer war in South Africa. Some 220 separate field cable-lines of 3,749 miles in length, and 2,191 miles of aerial line were constructed by them, the traffic on some of their main trunks being so heavy that they used Wheatstone automatic instruments. The telephone was also extensively used. The defense of Ladysmith was conducted entirely by telephone, and it was said that the telephone system saved the place when the Boers attacked Wagon Hill and Cæsar's Camp on January 6, 1900. To protect their long line of communication against the raids of the Boers, blockhouses were built at intervals of about 1,000 yards and every second or third one supplied with a telephone connected with centers for the dissemination of information and for the obtaining of succor. Certain of the blockhouses were supplied with telegraph instruments in addition to the telephone. "The blockhouses together with the systematic 'drives' organized by the Commander-in-Chief finished the war, as the Boers themselves confess."

In the Spanish-American war, though of short duration, the telegraph, telephone and cable played a most important part, both strategically and tactically. In the operations in front of Santiago the telephone was used to connect the trenches along the 13 miles of front. The bombardment of Santiago was directed by telephoning from the front to the shore, where range and direction were flagged to the fleet. The operations are summed up in the following extract from the official report of the chief signal officer for 1898:

"The major-general commanding the Fifth Army Corps reached by telephone points on the right, center, and left of his line within 400 yards of the enemy, and communication with his subordinate commanders was not only possible at all times, but was continuously maintained, as these lines worked twenty-four hours in the day. On the other hand, the major-general commanding the Fifth Corps was able to communicate directly with the admiral commanding the fleet through the telephonic station near Aguadores. In addition, the War Department, with all its bureaus and the supply depots of a great nation, were within 20 minutes of the general commanding, so that any deficiencies of equipment could be asked for or re-enforcements requested; and further, he was able to keep in touch with the President, the Secretary of War, and the Commanding-General of the Army, so as to receive at critical moments such advice, encouragement, or assistance as might advance the interests of the campaign."

In the Porto Rican campaign every part of the widely distributed invading army was connected by telegraph and telephone from the first day of landing at Guanica to the termination of the war. The telegraphic and telephonic service was such that within 33 minutes after the receipt of the cablegram announcing the armistice which suspended hostilities the commanders of three separate divisions of the army operating in different parts of the island miles apart were ordered to suspend operations. In the case of two of the commands the message arrived just in time to prevent actual contact, as the troops were in position for action, and at Guayama held the lanyards stretched on the guns to open the artillery duel. In the Philippine campaign and the subsequent insurrection, the telegraph and telephone were of great value, so much so, that the Commanding-General remarked in 1901: "It is not too much to say that in the absence of this efficient service it would be impossible to hold this archipelago with less than 150,000 men, which is now well and efficiently held by 60,000." During the insurrec-

tion some 4,851 miles of aerial line were constructed and 500 miles of submarine cable laid.

In the present war between Russia and Japan it can be inferred from the meager published reports of the operations that both sides are using electrical means of communication to their full extent. It is known that the Japanese armies are connected together by a system of field lines, their outposts by telephone and their bases with Chemulpo and Japan by cable. On the day before the battle of the Yalu, the fire of the Japanese howitzer batteries was controlled and directed by telephone, and on the day of the battle during the movement of the XII. Division its commander was continuously connected by telephone with the Commanding-General of the Japanese forces. The value of wireless telegraphy to the Japanese navy in its operations in the China seas, and to the Russians by allowing the commander of a beleaguered place to communicate with his home government, is too obvious for comment. It seems at the present state of the art that wireless telegraphy will not play as important a part in land communications as the telegraph or telephone until the present methods of its operation have been greatly improved upon.

The part played by the cable in the history of recent years has completely proved that its role is scarcely inferior to the military and naval forces themselves. All the colonial powers of the world have so arranged their means of cable communication that the cables are under their immediate control and touch only the shores of their own possessions or those of countries that are allied to them by treaty and community of interest. The control of the seas, one of the material elements contributing to the power and prosperity of a nation, is influenced largely by cable communications, and in a war in the future between two naval powers the result will depend largely on coal and cables.

LOOKING FOR TROUBLE.

"Yes, we are always looking for trouble," said the manager of a big telephone exchange, "and, strange as it may seem, it is sometimes difficult to find it."

Though it would seem like a sorry joke to say that trouble is hard to find, it is no joke in the telephone business. In fact, so important is the quick discovery and cure of trouble that every company of importance has a regularly organized department for the purpose, which, from the user's standpoint, is probably the most important department in the business, as a telephone "in trouble" is worse than none at all. The methods used in locating and quickly adjusting trouble in a telephone system testify to the progress of invention in electrical devices.

"Hello, exchange, our telephone, Main 2634, is out of order," is the usual way the tip of trouble reaches central.

"Can you get the exchange?" is the trouble clerk's question.

"We can't get anything," is usually the response, in tones expressive of anything but satisfaction over the situation. With this clew the "trouble department" begins work. Perhaps in the course of an hour the subscriber's bell will ring.

"Do you hear me now?" will come the question in gentle tones from the exchange operator. Of course you do and the girl knows you do, but she has simply adopted this polite way of informing you that your telephone is ready for talking again.

In many cases the subscriber's message that the trouble is over does not reach him over the wire. Frequently within a half hour after the subscriber has reported trouble an electrician with a carpet bag full of tools walks into his office and calmly begins "tinkering" with his telephone. This means that tests made at the central office show the trouble to be in the subscriber's instrument. In the former case the trouble was either in the exchange or along outside lines.

In the larger exchanges the "trouble" men are assigned to districts, with which they are thoroughly familiar. When a bit of trouble is reported to the main office it is jotted down by the special clerk, who refers her notes to the wire chief for a thorough investigation. He, by means of a voltmeter, determines where the trouble lies and what its nature is and reports it to the district trouble man. The voltmeter makes it possible, under favorable conditions, to determine within a few feet just where a break, crossed wire or grounded wire is located. It is this little machine which has solved the problem of quick repair.

In modern telephone construction, the larger part of the trunk lines run through lead cables. In this form of construction trouble on the outside system is reduced to a minimum. When trouble does develop in a cable line, the method of discovering it is most complex and delicate. The lead pipe contains from thirty to 300 pairs of wires, wrapped in paper tape and twisted into a compact cord. Paper insulation is considered the best for telephone wires. It is necessary, however, that the cable be kept absolutely moisture proof, a hole even the size of a pen point seriously interfering with its proper working. When trouble develops in any particular cable, it is located by opening the cable at the various repair boxes and "testing." In this way the section of cable in which the trouble is located is discovered.

To ascertain the exact spot where the trouble is located a very delicate and costly piece of apparatus is used. This consists of a battery, galvanometer, resistance box and bridge. The method consists first, in finding a good wire through the cable, or if the entire cable is bad, stringing an aerial line outside the cable. One end of the good wire is then connected to one side of the test and the distant end of the defective wire. The battery is then connected up and a current is sent through the wire, causing the galvanometer needle to fluctuate. The known resistance in the resistance box is then varied until a point is reached where the needle fails to tremble. This is when the known and unknown resistance on the opposite sides of the test are equal. With the resistance in the bad wire known, it is merely a mathematical process to discover how far from the testing apparatus the trouble may be found, as resistance is readily measured and the amount the various sizes of wire carry is well known.

Long distance testing is done in the same manner, and the success of the process is shown by the fact that in testing between larger centers the chief has frequently reported trouble within a quarter of a mile of the company's terminals at the farther end.

TELEPHONES AS THIEF CATCHERS.

"Telephones are coming in handy to catch horse thieves," said George C. French, exchange manager of the Wisconsin Telephone Company, Milwaukee. "They have not been used so much in Milwaukee as in the smaller cities of this and other states. There, when the robbery of a horse is reported, the sheriff telephones to the farmers on every road, and so many farmers have telephones now that this is practicable. After every farmer has been given a description of the stolen horse it is pretty difficult for the thief to escape, for he must pass out of the city over some country road and many captures have been made in this way."

Middle-aged men were grown boys when the first practical telephone made its appearance. Young men remember when its use became general in business offices and stores and a 15-year-old country-bred boy is old enough to have seen nine-tenths of the country telephones screwed fast to the walls of the farm house. Now scarcely a dwelling is unsupplied with a telephone. It is one of the absolute necessities of a business house and one of the greatest conveniences in residences.

Organization of the Independents

JAMES B. HOGE

WE have assembled together here for the purpose of forming an organization to be known as District No. 1 of the Ohio Independent Telephone Association, an organization which the officers and executive committee believe is planned on broad enough principles to take care of the needs of the entire Independent movement of the United States. The plan we propose will operate as far as this state is concerned as follows:

Have each of the nine districts thoroughly organized, membership to be composed of bona fide Independent companies who have no affiliations with any competing company, each company to be entitled to one vote for each 100 telephones or 100 miles of toll lines or fraction thereof they have in their system; the districts to hold semi-annual or quarterly meetings as they may think best for the purpose of considering subject matter of importance to that district and transacting any other business that may come before the meeting; the districts to elect annually one delegate to the state convention for each 1,000 telephones or 1,000 miles of toll line or fraction thereof they may have, the state association to consider the larger subjects that may be of interest to the Independent telephone interests of the state. The president of the district organization will be one of the vice presidents of the state association. In case this plan of organization meets with the approval of a sufficient number of the Independent telephone interests of the United States, and should be adopted by these interests in a national association, each state could then be organized along the same lines, and each state at their annual meeting elect delegates to the national association, this meeting to be based on one delegate to each 10,000 telephones or 10,000 miles of toll line or fraction thereof represented by the state conventions. The national association would then consider points of special importance to the Independent telephone interests of the United States and take action upon such business as might be submitted to them by the various state organizations. In this way the Independent telephone interests of the United States would be a unit.

This plan has been submitted to a number of prominent Independent telephone people in the central west and has quite generally met with their approval. Whether or not it will be generally adopted will depend to some extent upon how successful the district meetings to be held in this state within the next month may prove. A gentleman in one of the western states put it to me one day when discussing the subject this way: "There is no question at all but what it will work out successfully in Ohio, as they furnish the presidents of the United States and the organization for the world." I disagree with him on that point; nevertheless, inasmuch as Ohio has taken the matter up it must be no experiment. The plan seems perfectly feasible, and there is no question in the minds of all Independent telephone interests but what we need is a closer organization, one so organized that each and every meeting will consist of a representative body of men brought together for a specific purpose, who will transact the business before them orderly and return to their homes better equipped to take care of their respective companies.

This plan enables the officers and stockholders of the various companies to get together at some central point at a normal expense and with a loss of time not to exceed one day. These meetings can be held quarterly, semi-annually or annually, as may be thought best by the various districts. It seems to the executive committee that they should be held at least semi-annually, and we can readily see how much good can be done from holding meetings quarterly. Each district will have representatives to the state convention, and in case of the formation of a national association, will likewise have representation in that body, so that delegates could carry any point of special interest proper to be acted upon by the state or national association into either body. These delegates could at the first meeting of their respective districts report briefly the convention's proceedings. This is no new plan of organization; it means applying a well developed plan to a business that is sadly in need of organization.

The principal points to be considered can be summed up in four thoughts:

1. Importance of all companies adopting certain standards for their own good. It has not been many years since all the steam railways had their own ideas about gauge of track, grades, curves, rails, bridges, tunnels, depots, locomotives, cars, brakes, couplings, etc., the operating departments had different ideas about way-bills, some making daily, others weekly and others monthly report, each company sold tickets over their own lines, or over but a few connecting lines; locomotive whistles, different colored lights, and flags, meant different signals on different roads, in fact there was no uniformity. A telegraph operator working at some junction point of two or more roads was constantly getting mixed up with reference to rules and regulations, forgetting for the moment which road he was working for, which frequently caused loss of life and valuable property. The organizations finally got together, adopting standard gauge track, standard locomotives, standard cars, brakes, couplings, bridges, tunnels, etc., and in the operating departments standardizing signals, time, form of ticket, way-bill, reports, distribution of accounts, and various other things too numerous to mention, all of which has simplified the operation of the property and enabled their patrons to become acquainted with the system so as to avoid asking needless question, avoids confusion in checking baggage, transferring of passengers and freight in cities, etc. Arrangements were made for Pullman cars to run through from St. Louis or Chicago to San Francisco, or from St. Louis or Chicago to Boston or New York, so that you can cross the United States to-day with one change of cars. All of this has been brought about by organization. It is more important that the Independent telephone interests systematize their work than it was for the railroads, for the reason that we use our equipment one with the other instantaneously. A telephone line, like a chain, is no stronger than the weakest link in it. The railroad properties have their individual stockholders, directors, and operating officials, the same as the telephone properties have to-day. There is, therefore, no reason why we cannot adopt standards for all of these points that will work as perfectly as though the entire property was owned by one company. The same haphazard conditions have existed in practically every other business; some notable examples being the plumbing, printing, electric light, electric power and gas business, all of which have been standardized.

In a very short time the Independent companies will be equally as well or better equipped with long distance lines than their competitor, just the same as they are better equipped in a majority of their exchanges. We should, therefore, commence now to put our properties in order.

[Note.—Address of James B. Hoge, vice president of the Ohio Independent Telephone Association, before the convention held at Hotel Euclid, Cleveland, Ohio, August 16, 1904.]

This is the season most generally adopted as the vacation season of the year. We find a large number of people from the larger cities sojourning in the country districts, and people from the smaller cities and country districts visiting in the larger cities. Many of these people find it necessary to be in touch with their homes or places of business daily. In most cases within a radius of 150 miles of Cleveland the Independents are able to give first-class service; in some few cases they are not. If one of the points where we are not able to give good service belongs to any of the companies represented here the reason should be found and the guilty parties should at once undertake to remedy the trouble. I frequently hear the remark, "Well, the Independent service is better than the Bell." This does not excuse the poor service. What we are selling is service and we must therefore strive to bring it up to the highest standard and not measure it by the poorest standard.

2. There are a number of companies quarreling over the same territory. As far as I know there is none of this in District No. 1. If there is I hope the representatives of those companies will be frank enough to state the fact and let this association undertake to straighten it out.

3. There have been some few cases where a second Independent company has entered the field due to some petty jealousy or some other difficulty. These conditions should be discussed and this association can easily guard against such raids in future.

4. The Bell people are trying to get certain of the smaller companies to sub-license with them, having them use Bell instruments, switchboards, etc., if possible; in case they cannot accomplish that, get them on most any basis possible. The Bell representative tells Mr. Independent at Squashtown that he has secured contracts with practically all the other important Independent companies and that the general officers do not really want his company, but that he, the agent, has a right yet to connect up with him, and he has always admired the fight that Mr. Independent at Squashtown has made, therefore, he wants to see him make the change and get in out of the wet. Once in a great while this plan works out, but so far the exchanges accepting the Bell's overtures have been of very little importance, and in nearly all cases they are anxious to come back.

Now, gentlemen, with the proper kind of organization all of these points can be taken care of. If Mr. Independent at Squashtown has the foregoing statement made to him he will call upon his district organization for advice and will then find that his would-be benefactor is not such a good friend after all. There is no use fooling ourselves. We have much to be proud of, and yet are a long ways from being perfect. I take it that there is not a single person within the sound of my voice that is not anxious to have his property part of the best system that the world can produce. The Independent companies in the past ten years have installed more telephones than their competitor has in twenty-seven years. Many of the brightest technical minds are associated with the Independent manufacturers and Independent operating companies. Many of the strongest financial interests of the country are heavily interested in their securities. Many of the ablest politicians of both parties are in the Independent ranks. The stockholders and business managers of the properties are usually representative men of their respective communities. The question now is one of organization and must be left for the consideration of all the companies, and the future must depend upon your action.

President Wheeler of the Illinois Telephone Company says the tunnels under Chicago's streets will be ready for operation about December 1. The first work which will be undertaken will be the delivery of coal to office buildings and hotels. The company now has in operation 8,000 instruments, all in the territory between the river, Twelfth street and Lake Michigan.

TELEPHONES ON TROLLEY CARS.

The Terre Haute, Indiana, Electric Railway Company has constructed a new system of communication along its new Clinton line. Instead of having telephones at its switches, as it has on its Brazil line, each interurban car has a telephone, and when communication is desired, it can be secured almost any place along the line. This is made possible by stringing the telephone wires along the trolley poles, and having plug holes in certain poles similar to the plugs used on a switchboard at a telephone exchange. Each car telephone has a long wire, on the end of which is the plug to be inserted in the pole. All that is necessary is for the car to stop in front of the plug-pole, "plug in" and call up the train dispatcher by ringing the bell.

THE FARM TELEPHONE.

That the American farmers are the most progressive tillers of the soil is a well-known fact. When one comes to look up the statistics of the telephone world, however, he becomes duly assured of this fact when he finds that such a large per cent of our farmers are enjoying the benefits accruing from the rural telephones.

The establishment of telephone lines in the rural districts began only a few years ago, and it is estimated that at the present rate of increase, in ten years from now every prosperous farmer will be able to talk to anyone hundreds of miles from his home who is similarly equipped.

The rural telephone is not only a comfort to the farmer and his family, but it is a great protection in case of sickness. There are already many instances on record where lives have been saved or large doctor bills avoided on account of the farm telephone.

To the farmers' wives who are too often so far away from her neighbors that it is impossible for her to find time to visit them during the week, it is a great boon. By means of the telephone, they call up any of their neighbors for miles around and indulge in a pleasant little chat which will cheer them up, robbing farm life of its former lonesomeness. The coming generation, ten or twenty years hence, will wonder how it was possible for their parents to get along without rural telephones.

The telephone is not only a comfort to the farmer, but by means of it he can keep in touch with the markets and thus become a closer seller and buyer, saving the cost of his telephone many times over.

The rural telephone will have a tendency to make the farmer a keener business man, as it will enable him to come in closer touch with many more business men than he has heretofore been able to communicate with.

TELEPHONE TRANSMITS FACE.

A telephone arrangement by which a person speaking may also see the face of the person at the other end of the line has, it is claimed, been invented by J. B. Fowler of Portland, Oregon. Two months ago Mr. Fowler conceived the idea which, followed out, resulted in an apparatus which he exhibited a few days ago for the first time. How far it will be possible to see the faces over the wire is yet to be demonstrated.

To the observer appears an apparatus much resembling the front end of a large camera. There is also a telephone transmitter. To see over the wire one puts his eyes to the tube which corresponds to the lens of a camera.

Miss Lillian Fowler went to the other end of the wire, twenty-five feet away in another room, and where any reflection by mirrors was out of the question, and her face showed up as distinctly and clear as in a miniature painting. As she spoke her lips were seen to move. The observer was in darkness, that he might see the more clearly.

The Telephone in Court Circles

It has been decided that where the terms of contract are discussed over the telephone, the place of contract is the residence of the party accepting the offer.

An action for $20,000 damages has been brought against the Avon (N. Y.) Telephone Company for causing the death of Charles Rockafellow by an electric shock and fall from a telephone pole last April.

The legal tangle involving the Farmers' and Pekin (Ill.) Independent Company will be considered by a special master in chancery. It is believed the trouble existing between the two companies will be amicably adjusted, and will likely lead to a consolidation of interests.

A telephone war is on in Mt. Sterling, Kentucky, between the East Tennessee and Old Kentucky companies. An injunction has been granted the Old Kentucky company and work has been stopped. The latter claims an exclusive franchise, and a suit will probably result.

At the last general assembly of Illinois a law was passed placing the property of telephone companies, especially the lines and poles, under the class of real instead of personal property. Under the former law telephone property, being considered as personal, could not be mortgaged.

Mrs. Ella C. Simkins of Philadelphia has entered suit for $10,000 damages in the Cumberland County court against the Interstate Telephone Company. While at Vineland, Pennsylvania, July 4, Mrs. Simkins fell into a telephone pole hole and claims to have received internal injuries.

Probate Judge Jones of Hamilton, Ohio, has decided that the Middletown (Ohio) Home Telephone Company has a right to maintain an action against the city of Middletown, through which it seeks a franchise in that municipality. The city council failed to act upon the application of the company under the terms desired.

The Columbus & Lake Michigan railway company is made defendant in an injunction suit brought by the Lima (Ohio) Telephone Company to restrain defendant from tearing down or removing poles, which is said to have been done of late, in Col. Hobart's anxiety to get his line through. Judge Miller granted a temporary restraining order.

District Judge Stewart of Boise, Idaho, in passing on a telephone contract, held that the Rocky Mountain Bell Telephone Company was not legally qualified to transact business in Idaho, having failed to comply with the new law requiring the filing of articles of incorporation. The case will be appealed to the Supreme court. If affirmed, the effect will be far-reaching, invalidating every contract with the with the company in that state.

Judge Hazel, in the United States Circuit court, at Buffalo, New York, recently handed down a decision in the case of the Western Electric Company of Chicago against the Rochester Telephone Company, Frederick Cook and Eugene H. Satterlee of Rochester. The suit was brought to establish an infringement by the defendants on certain improvements in signal apparatus for telephone service, patented by the complainant. Judge Hazel holds the defendants' apparatus, while similar in some ways to that of the complainant, does not infringe on the patent and the bill of complaint is dismissed with costs.

District Judge Stewart of Washington recently, in passing on a telephone contract, held that the Rocky Mountain Bell Telephone Company was not legally qualified to transact business in that state, having failed to comply with the new law requiring the filing of articles of incorporation. The case will be appealed to the Supreme court. If affirmed the effect will be far reaching, invalidating every contract with the company in this state.

J. F. McCary, a merchandise broker of Birmingham, Alabama, has filed a novel suit in the circuit court against the Southern Bell Telephone and Telegraph Company for $1,999. He asks this amount as damages, claiming that on November 15, 1903, the defendant published a telephone directory, as was its custom at certain intervals, and failed to give his name as a subscriber. The plaintiff says that he was a subscriber, and his business was damaged by the absence of his name to the amount asked for.

The Cuyahoga Telephone Company of Cleveland has sued for an injunction against Fred S. Avery, proprietor of the Hotel Euclid, and the Cleveland Telephone Company, claiming that a private exchange which it had installed in the hotel, and which it owned, had been disconnected from its line and attached to the Cleveland Telephone Company's lines. The petition says Avery refuses to furnish the necessary bond and has taken possession of the telephone exchange wrongfully.

Initial steps in a suit to recover a $5,000 bond have been taken in Media, Ohio, by A. A. Cochran, Esq., representing the city of Chester. The plaintiff is the United Telephone and Telegraph Company. When an ordinance was granted by the city giving the Delaware County Telephone and Telegraph Company permission to place poles and string wires, it was stipulated that the property of the latter could not be sold or leased. It is claimed that the United company has purchased the property, hence the action.

In the Supreme court of New York Judge Scott has refused to grant a mandatory injunction restraining the New York Telephone Company from interfering with the telephone service which it had contracted to furnish to the New York & New Jersey Distributing Company. He suggested that if any contract to furnish the service had been violated the remedy was an action for damages, and further if the company believes its property is being used for unlawful and immoral purpose a telephone company has the right to refuse to live up to its contracts.

The point as to whether or not the moving of a house is an ordinary use to which a street may be put will probably decide the question of the right of the council to compel the Duluth (Minn.) Telephone Company to remove its wires to permit the passage of a building. The Supreme courts of some of the eastern states have held that moving a house along a street is not an ordinary use of the street, but the point has not yet been settled by the Supreme court of Minnesota. It will, however, come up just as soon as the next application is made for an order to the company to open its wires.

Telephone Tales Tersely Told

An automatic exchange is to be established at Pentwater, Michigan, by the Lake Shore Telephone Company.

The Tri-State Telephone Company of Winona, Minnesota, has declared its fifth quarterly dividend of 1½ per cent.

The Youngstown (Ohio) Telephone Company has increased its capital from $200,000 to $400,000, and will make important improvements.

The Independent Telephone Company of Seattle, Washington, has connected its lines with Vashon Island and began giving service October 1.

The Delaware & Madison Counties Telephone Company of Muncie, Indiana, has decided to spend a large amount of money in improvements.

The city council of Waldosta, Georgia, threatens to revoke the franchise of the Bell company in that city unless there is a speedy improvement in its service.

The Payette Construction Company of Sioux City, Iowa, secured the contract for the erection of the Sioux City Telephone Company exchange building at $19,419.

It is the purpose of the Pittsburg & Allegheny Telephone Company to connect every Independent plant within 100 miles of Pittsburg with long distance service.

According to the report of the Indiana tax commissioners the mileage of the Independent telephone companies in Indiana is 64,000, a gain of 16,000 miles over 1903.

The Badger Telephone and Telegraph Company will have a toll line in operation between Racine, Wisconsin, and the Mississippi river by November 1. The right of way has been secured.

The Home Telephone Company of Los Angeles, California, is installing five new substations, to be completed November 15. These will increase the company's capacity to 20,000 subscribers.

The Home Telephone Company of Kansas City, which was built by local and St. Louis interests, has not yet completed the first year of its existence and has nearly 10,000 telephones in service.

The Grayson County (Texas) Telephone company at a recent meeting declared a dividend of 10 per cent on both the preferred and common stock. It was also decided to issue $10,000 additional stock and to further extend the lines.

The Kingman, Nevada & California Telephone Company, which operates in Kingman Needles, and from Manvel to Searchlight, will construct telephone lines to all mining camps in the Nevada, Arizona and southern California deserts.

The semi-annual report of the Louisville (Ky.) Home Telephone Company to the city controller shows that the company now has in operation 6,421 telephones. The company is required to pay the city $1 a year for every telephone in excess of 6,000.

A trust deed for $50,000,000, made by the State Independent Telephone and Telegraph Company, which has offices in Jersey City, New Jersey, and Chicago and Aurora, Illinois, to the American Trust and Savings Bank of Chicago, as trustee, has been filed.

The Northern Pacific railroad has let contracts which will practically revolutionize the present system of train dispatching over the mail line west and will substitute the telephone system for the telegraph on long and important stretches of the St. Paul-Portland route.

Connections have now been established with Indianapolis and Richmond, Indiana, by the Home Telephone Company of Dayton, Ohio, over its long distance wires. This new circuit enables the company to offer excellent long distance service to all points in Indiana.

Thirty-five carloads of poles were recently received at Lincoln, Nebraska, by the Lincoln Telephone Company, to be used in the building of long distance lines. Work on extensions to Crete, Clatonia and Wahoo will begin at once, according to the decree of the stockholders.

E. H. Moulton of Minneapolis, president of the Tri-State (Twin City) Telephone Company, has made arrangements for extending the line from Minneapolis to Sioux Falls, South Dakota, and Austin and Albert Lea, Minnesota. It is also planned to build from Austin east to La Crosse, Wisconsin.

Supervisor Braunhart of San Francisco takes exception to the proposal of the police and fire commissioners to acquire a municipal telephone system. He declares the matter lies entirely with the supervisors, who have no such intention in mind. He says the city has a thirty year agreement with the telephone company for a free telephone system in the city hall, which is worth $30,000 yearly to the city, and that there is no intention on the part of the supervisors to make a change.

The Union Telephone Company of Alma, Michigan, has again declared a semi-annual dividend of 4 per cent on its capital stock. The company is capitalized at $400,000, which is represented by over 400 stockholders, located in the counties of Gratiot, Montcalm, Isabella, Clare, Washtenaw and Clinton.

Secretary Davidson of the Iowa State executive council has just completed sending out the certificates of telephone assessments. These show that there has been a total increase of 800 lines in Iowa during the past year. The greatest number of farm lines in any one county is in Linn, which has 138.

The American Car Telephone Company announces that it will install telephones in the cars of the St. Louis, St. Charles & Western, an electric railroad running between St. Louis and St. Charles, Missouri, and that a line will be constructed for the purpose of telephoning from offices or stations along the road to persons on the cars.

The question of buying out the Maryland Telephone Company's municipal office equipments in Baltimore is being considered. This would include about 203 miles of cables already in the subways and about 54 miles of aerial wire. The plan, if carried out, would prove the first step toward municipal ownership of telephones in Baltimore.

W. H. Wilson of Erie, Pennsylvania, general manager of the Union Telephone Company, states that negotiations are on for the acquisition of the Mercer and Lawrence county telephone companies, which will perfect the system connecting Erie, Pittsburg, Buffalo and Cleveland. More than 1,200 miles of coppper wire will be strung.

The recent construction of three toll lines between Dayton, Ohio, and Richmond, Indiana, has formed the connecting link between the Independent companies of Ohio and Indiana—"a consummation devoutly to be wished," as the various interests of the two states demanded an interconnection between the various Indepenednt companies.

The board of education of Chicago will install an Independent telephone system, connecting the board rooms with the 250 schools in that city. A sub-committee of the buildings and grounds committee, composed of President Mark, Chairman Thorp of the buildings and grounds committee and Trustee Thompson, has charge of the plans.

The building to be occupied by the Sioux City (Iowa) Telephone Company will cost $30,000, including heating plant, but exclusive of switchboards. It will be absolutely fireproof. There will be no woodwork in the building. The window frames will be of metal, all finishings around the doors will be fireproof, and the floors will be of Mosaic tile.

The Zenith Telephone Company, operating in Duluth, Minnesota, is now expending between $75,000 and $100,000 in enlarging and improving its plant. When the work is complete the company will be in a position to handle 1,000 more subscribers, making the total capacity of the plant about 3,500. At present about 2,500 names are on the books as subscribers.

The Mutual Telephone Company of Yazoo City, Mississippi, reports for the quarter that its receipts have been $7,554.13, while its expenses amounted to $5,457.63. The report further adds: "May 25, 1904, the conflagration in Yazoo City destroyed about three-fourths of our system, including the exchange." The company has rebuilt two-thirds of the system.

Five thousand bonds of the South Bend Home Telephone Company were recently sold at McMinville, Yamhill county, Oregon. C. F. Pfeiffer of Fort Wayne, who negotiated the sale, states that the block of 5,000 sold at par and accumulated interest. The showing of profits since the exchange has been in operation has made the stock one of the most desirable on the market.

The American Long Distance Telephone Construction Company, organized by the Barber-Brailey syndicate of Toledo, Ohio, has sold its properties in a score of Kansas towns to a syndicate of St. Louis men, who took over the bonds and half of the stock, it is reported. The other half of the stock remains in the hands of the original holders. The consideration is reported to have been $225,000.

The immense new switchboard for the Des Moines (Iowa) Mutual Telephone Company's new exchange has been installed. The fireproof exchange building is completed, as is also the underground conduit system, while the cables have been stretched and are

ready for the connections. It is expected that within a fortnight the new exchange with its 2,400 telephones will be in complete working order.

The Illinois Tunnel Company is said to have now in service more than 8,000 trunk line telephones. The Chicago Telephone Company has more than 14,000 telephones in the business district, but of this number only a small percentage is trunk line service. The Illinois Company is just beginning to put out extensions and President Wheeler predicts there will be 25,000 instruments in service within twelve months.

John Kurtz, a resident of Vandalia, Illinois, has just been granted a patent on a new principle telephone, with four combination claims and seven new improvement claims, eleven claims in one patent being allowed. The Kurtz International Telephone Company of Washington, D. C., has been organized with a federal charter for $10,000,000, fifty per cent of the stock being held in trust for the patentee, Mr. Kurtz.

At a meeting of the directors of the Columbus (Ohio) Citizens' Telephone Company it was decided to issue $300,000 worth of preferred six per cent stock. The proceeds derived from the sale of this stock will be used in making needed improvements. The company now has seventy-nine miles of conduits in Columbus, 8,000 poles and 4,000 miles of wire outside of the cable system. The company has 5,200 direct telephones in use and 2,000 extensions.

The Sandusky (Ohio) Telephone Company furnishes daily forecasts of the weather to fifty-three exchanges and toll stations. With these fifty-three exchanges there are connected at the present time 5,260 subscribers. Of that number 876 are rural subscribers and thirty-one toll stations which are located in small hamlets. The territory covered includes the whole of Erie and Huron counties and parts of Sandusky, Seneca, Crawford, Richland and Lorain counties.

Marquette, Michigan, it is believed, is the banner telephone town of the state, if not the United States, population considered. The population is only about 10,000, yet there are some 1,400 telephones in use and more are being installed right along. Two distinct systems cater for patronage, the Marquette County Telephone Company, an Independent corporation, and the Michigan State, allied with the Bell. The Independent line is more than holding its own and pays annual dividends to its stockholders.

The Franklin County Telephone Company of Columbus, Ohio, has been incorporated to build lines connecting that city with Westerville, Worthington, Galloway, Groveport, New Albany, Dublin, Hilliards, Lockbourne, Heyden, Reynoldburg, Pleasant Corners, Black Lick, Girls' Industrial Home, Central College, Alton and a number of other places. Some of the lines have already been built. The capital stock is $150,000 and the incorporators are Isaac B. Cameron, Seth L. McMillan, Ralph Reamer, Homer L. Rose and Charles F. Johnson.

The Lee County (Ill.) Telephone Company will rebuild its entire system at a cost of $75,000. The work of installation will be begun at once and it is expected to have the work completed within three months. The circuits will be full metallic, with no party lines. The conduit work planned for the business district will be for ultimate capacity of 2,500 telephones. D. R. Craig of Aurora will superintend the construction work. The Lee County Telephone Company was organized in 1896 by Louis A. Pitcher, who holds the office of president, and is also general manager.

At the annual meeting of the stockholders of the Monmouth (Ill.) Telephone Company, the reports of the officers showed the company to be in a flourishing condition. It has been in operation three years and has 998 telephones in service, 711 of which are in Monmouth, the other 287 being used in the country service. The report showed receipts to the amount of $12,609.65, the operating expenses being $6,808.60. Of the balance, $3,000 was paid as interest on bonds. The net balance of $2,801.05 will be used for the extension of the business and various improvements.

There has been organized at West Union, Iowa, the Rogers Telephone Company, in which a number of persons widely known are interested. Among these is Ex-Senator Charles A. Towne, now a well known Wall street operator, and J. C. Clarkson, surveyor of the port of New York. Others in the formation of the company are Oscar Wentworth Rogers, C. H. Talmage, T. C. E. Blanchard, Coker F. Clarkson, W. P. Hurlbut, Omar Rogers and A. W. Wright. The capital is $50,000. The purpose is to establish new telephone systems. Oscar Wentworth Rogers is the moving spirit of the enterprise.

The recent incorporation of the Direct Line Telephone Company with San Francisco as its principal place of business, has made a stir in telephone circles around the Bay. This action was taken shortly after the announcement was made that the persons interested in the Home Telephone Company of Los Angeles were in the market for $1,000,000 worth of telephone line supplies and that it was more than probable that San Francisco was the objective point. According to the articles just filed the Direct Line Telephone Company's proposed lines will start from the corner of Kearny and Bush streets, San Francisco, and will eventually make connections with all of the towns on the Pacific Coast. The company's capital stock is fixed at $1,000,000; actually subscribed, $118,000.

Fifty Cincinnati "hello girls" have been discharged for flirting over the wires. They fell into a trap laid by the management, and did not know why they had been summarily discharged until they began to compare notes. Nearly all of them recalled that for some time past a strange voice had been calling up from various parts of the city and had invariably flattered them. The man would then give the name of some prominent merchant or politician, and in nine cases out of ten the unsuspecting "hello girl" would respond to the flattery. New rules have been issued that are severe against flirtation over the telephone.

The annual report of Secretary Fisher of the Citizens' Telephone Company of Grand Rapids, Michigan, showed that the net gain of telephones in the system during the last year has been 2,357, or almost seventeen per cent. The amount of capital stock now outstanding is $1,609,280. The number of city telephones in service, 5,605; total Grand Rapids connections, 328,168, an increase over last year of 39,596, or 14 per cent. The company has purchased the telephone system at Allegan, which includes that city, Hopkins Station and Otsego, giving eighty-three miles of new toll lines.

The Independent Telephone Company at El Paso, Texas, it is authoritatively announced, will be in operation by December 1, 1904. The receiver has been discharged in the bankruptcy case of Mrs. Anna M. Brett, who has for years been promoting the Independent Telephone Company in that city, despite having been handicapped many times by unforeseen difficulties. Just as soon as the bonds now being printed are returned to the members of the company and signed the remaining work will be completed, she declares. It has not yet been decided whether the full metallic central energy system or the automatic system will be used.

The threatened invasion of rival Independent telephone companies into the territory now monopolized by the Bell company in Omaha promises to result in immediate good to that city in the way of reduced telephone rates. The assertion is being made on all hands (and not denied) that the Bell concern has decided to make a reduction in its rates in Omaha, but, in order to justify councilmen who voted against the proposition to submit the question of a franchise for an Independent company to the people of Omaha, the impending reduction is to be made through an ordinance, so as to place these councilmen in a position to claim that they did it.

Barber & Brailey, the Independent telephone constructors of Toledo, Ohio, in company with Leo M. Flesh and S. K. Statler, prominent capitalists and bankers of Piqua, Ohio, and other interests, have purchased of W. H. Crumb & Co., the widely known Chicago firm of engineers, the new Independent telephone plant in Hot Springs, Arkansas, for a consideration of $110,000. The plant will be greatly extended and connected up with other Independent lines. The Toledo syndicate took possession September 1. This is said to be the eighth company that has been promoted by the Barber & Brailey syndicate, and is considered to be the best so far handled by that company.

The telephone question is again being agitated at Evansville, Indiana. The old franchise has been withdrawn and a new one presented by the Home Telephone Company, which is practically the same as the original, with the exception that $3,000 instead of $4,000 is offered the city as a bonus. The company agrees to have its plant in operation within one year after the ratification of the franchise by the council, and to insure that the terms of the franchise will be carried out the company agrees to deposit a bond of $10,000 to insure the city against all loss and another bond of $3,500, which is to be forfeited in case the plant is not built. The Home Company is now the only one in the field, the Citizens' company having withdrawn.

It is stated that H. E. Huntington has absorbed about thirty additional Independent telephone systems and leased lines in Texas, Arkansas, Indian Territory, Louisiana and Oklahoma, many of them being located in prominent cities, including Galveston, Houston, Dallas, Fort Worth, San Antonio, South McAlester, Little Rock and Oklahoma City. It is understood that Mr. Huntington and his associates have set aside $10,000,000 with which to organize a rival company to the Southwestern Telephone & Telegraph Company. It is also learned upon good authority that the Southwestern consolidation is but a nucleus with which to initiate a telephone organization that will give local and long-distance service throughout the United States.

Arrangements for the reduction of the debt of the Federal Telephone Company have had a good effect upon telephone securities in general, and the stock exchanges at Cleveland and other places have had opportunities for selling them when they can be had. It is beginning to be thoroughly recognized that the trouble experienced by the Everett-Moore syndicate was not that the properties were bad, but that they were caught under the necessity of placing some large bond issues when financial conditions were not favorable. The securities and the properties on which they are issued are as good as they ever were. The syndicate affairs have not been allowed to affect the individual companies, and the work of development has gone on as rapidly as could be under the circumstances.

PERSONAL

A. E. Dobbs is supervising construction work at Watseka, Illinois.

R. J. Moore has been granted a telephone franchise at Glasgow, Montana.

S. Jones of Canton, Ohio, has purchased the Canton telephone exchange.

Oscar S. Wright is installing a third telephone system in Corydon, Indiana.

E. F. Edwards will install a telephone system at Brinsmade, North Dakota.

E. McCanless has been appointed manager of the Ennis, Texas, telephone exchange.

E. L. Wirt has purchased an interest in the Garden City (Kan.) Telephone Company.

F. H. Hilbush has become sole owner of the Bristol (Ind.) Telephone Company.

George Rowe is the new manager of the Farmers' Telephone exchange at Keosauqua, Ohio.

M. T. Sherman of Joplin, Missouri, will install a new telephone system at Jennings, Oklahoma.

F. Ivers will act as manager of the telephone exchange at Auburn, Nebraska, after October 1.

Homer Wood is seeking a franchise to construct and operate a telephone system in Geneva, Ohio.

John Stroman of Swanville, Minnesota, will construct a telephone line from Avon to St. Cloud.

W. B. Thompson has been appointed manager of the Home Telephone Company at Hamilton, Ohio.

E. M. Jenkins has been appointed manager of the Wabash telephone exchange in Vincennes, Indiana.

H. M. Eldred has taken the management of the Standard Telephone & Electric Company, Milwaukee.

C. A. Mann has purchased the telephone exchange at Moulton, Iowa, and will improve the same at once.

J. P. Wilkinson has purchased the entire business of the Comanche (Texas) Telephone Company.

R. B. Lockhart of Pittsburg, Texas, has sold his telephone exchange at Italy, Texas, to C. M. Mitchell.

Dennis & Son of Moran, Texas, have disposed of the telephone exchange at that place to N. H. McElroy.

W. E. Westfall of the Grayville (Ill.) Independent Telephone Company will rebuild his exchange at Crossville.

William Bromelsick has been selected president of the Independent Telephone Company at Lawrence, Kansas.

C. H. Knight, manager of the telephone exchange at Brookings, South Dakota, was recently in Chicago on business.

C. H. Webb has purchased P. H. Heuring's interest in the Independent Telephone Company at Petersburg, Indiana.

Clarence A. Cotton of Detroit has been appointed manager of the Home Telephone Company at Bloomington, Illinois.

Frank E. Zalesky of Lisbon, Iowa, has been appointed superintendent of the Fairmont (Minn.) Telephone Company.

Charles Kester has been appointed secretary and manager of the People's Mutual Telephone Company at Hillsboro, Illinois.

F. W. Pardee, general manager for Frank B. Cook, Chicago, is recovering from a severe illness of several weeks' duration.

J. W. Smith has been appointed manager of the exchange of the Union Electric Telephone Company at Moline, Illinois.

Fritz Jones of Indianapolis is superintending the constuction of the new Independent telephone system in the City of Mexico.

W. C. Hanbury of Gravette, Arkansas, has become part owner of the Springs company telephone exchange at Eureka Springs.

Messrs. Lowry and Wallace have just completed a thorough remodeling of the telephone system at Kingstree, South Carolina.

Rand & Waters have applied to the city council of El Paso, Texas, for a franchise to operate a telephone system in that city.

D. L. Grace of Willow Springs, Missouri, has been appointed manager of the Glasgow, (Mo.) Telephone Company's exchange.

Oscar B. Dorman, formerly manager of the telephone exchange at Marshall, Texas, has been succeeded by Mr. Johnson of Bowie.

William Allen, who has been manager of the telephone exchange at Springport, Michigan, for the past year, has sold his interest to Andrew Wiselogel.

J. A. Stratton of the Fisk-Newhall Telephone Manufacturing Company, Chicago, recently installed a switchboard at Polo, Illinois.

W. A. Clow of Ewing, Missouri, has just completed a new telephone line from Benbow, Missouri, to Ewing, a distance of thirteen miles.

W. W. Collier has sold the Bainbridge (Ga.) Telephone Company to local capitalists, who will greatly improve and extend the same.

Miss Edna Pendleton has been appointed manager of the exchange of the Worth Mutual Telephone Company at Denver, Missouri.

A. B. Boren, late of Amarillo, New Mexico, has leased the telephone exchange at Tucumcaria, New Mexico, for a period of three years.

C. T. Dahl has been elected treasurer of the Home Telephone Company at Raleigh, North Carolina, to succeed L. J. Olson, resigned.

George F. Stearns of Eagle Grove, Iowa, has been appointed manager of the Enterprise Telephone Company at Edgerton, Minnesota.

Sylvester Cecil has been appointed manager of the Bourbon Home Telephone Company, at Paris, Kentucky, vice C. Humbert, resigned.

D. O'Dell of Rome, New York, has succeeded C. D. Juvenal as manager of the Home Telephone Company's exchange at Springfield, Ohio.

Sylvester Cecil has been appointed manager of the Bourbon Home Telephone Company at Paris, Kentucky, to succeed C. Humbert, resigned.

W. A. Strickland of Turner, Kansas has asked the council of Argentine, Kansas, to grant him a franchise to extend the system into that city.

John Hansman of Graville, Illinois, has formed a partnership with W. F. Westfall in the telephone line between Carmi and Centerville, Illinois.

E. C. Willis has succeeded Harry M. Moorhead as superintendent for the Standard Telephone and Telegraph Company at Newtown, Pennsylvania.

E. H. Martin is no longer connected with the Mutual Telephone Company at Webster City, Iowa, having disposed of his stock and resigned as a director.

Clarence H. McConnell, foreman of the Christian County (Mo.) Telephone Company, and Miss Amy G. Roberts of Sparta, Missouri, were recently married.

Mr. and Mrs. A. B. Clark of Oskaloosa, Kansas, have purchased the Independent telephone exchange at Herington, Kansas, taking possession September 1.

C. N. Sandbeck, late of the Standard Telephone Company at Preston, Minnesota, has accepted the management of the local exchange at Spencer, Iowa.

Walter Juliff and Earl Cogdell, who recently purchased the telephone exchange at Granburg, Texas, will extend the line from Bluff Dale to Stephenville.

J. Sanford Buck, superintendent of the Seymour (Iowa) Telephone Company, recently passed through a severe siege of illness, but is now nearly recovered.

W. S. Edwards has resigned his position as manager of the Union Telephone Company at Bonaparte, Iowa, and has been succeeded by Mr. Bell of Burlington.

J. T. Wilson and C. W. Young of New Hartford, Missouri, have been granted permission to construct a telephone line from New Hartford to the Lincoln county line.

H. C. Dodge, who is promoting the Milwaukee Independent system, was in Chicago recently, on important business in connection with the furthering of the enterprise.

W. H. Settle, who was recently given a franchise to establish a local telephone system at Madisonville, Kentucky, will begin the work of construction in the near future.

W. H. Wilson of Erie, Pennsylvania, general manager of the Union Telephone Company, contemplates the purchase of the Mercer and Lawrence county telephone lines.

Leslie Gilmore, manager of the Independent telephone exchange at New Concord, Ohio, and Miss Lena M. Gaston of Janesville, Ohio, were recently united in marriage.

Harry T. Liter has just completed a telephone system at Blackburn, Missouri. He is owner and operator of the same, and will soon extend his line into the country north.

G. W. Byrkett, manager of the Whitestown (Ind.) Citizens' Telephone Company, while stretching a wire across the Indianapolis & Northwestern interurban right of way, caused it to come in contact

with the high tension wire of the company, and was seriously burned. The telephone wire burned and parted, else he would have lost his life.

George P. Player, manager for the Kinloch Telephone Company at St. Charles, Missouri, has resigned to take charge of an Independent telephone company at Ft. Worth, Texas.

George Kelson and Albert Jasperson of Tyler, Minnesota, propose to construct a telephone system for Ivanhoe, Minnesota, with connections with Arno, Hendricks and Minnesota.

Manager Garey of the Home Telephone Company of Joplin, Missouri, was in Alba, Missouri, recently to investigate the advisability of putting in a small exchange at that place.

J. W. Beebe, manager of Union Telephone Company at Dodgeville, Wisconsin, was thrown from his motor-cycle recently, while running at a high rate of speed, and terribly injured.

J. A. Gordon of the International Telephone Manufacturing Company, Chicago, has recently taken charge of the construction of the public service telephone system in Neepawa, Manitoba.

W. N. Cannon, proprietor of the Greenville, Alabama, telephone exchange, is preparing to install a complete new common battery system, entirely reconstructing his old exchange.

F. J. Pazak, telephone engineer and contractor, has opened an office in the Crossley building, San Francisco, for telephone engineering and construction of Independent telephone systems.

Fred W. White, manager of the telephone system at Lowell, Michigan, has resigned his position to accept the management of the Independent telephone exchange at Saranac, Michigan.

James B. Bonnar, for three years with the Ashtabula (Ohio) Telephone Company, has accepted a position in the engineering department of the North Electric Company, Cleveland, Ohio.

J. D. Love, manager of the Home Telephone Company at Long Beach, California, and who installed the system, has resigned and will be succeeded by R. N. Crowe of the Santa Ana exchange.

Manager Thompson of the Hamilton (Ohio) Home Telephone Company announces that the company will entirely rebuild the line of the Scipio Telephone Company, which it recently purchased.

F. C. Belknap, James Rote, Ira Gates and Morris Belknap of Orangeburg, Illinois, are interested in an organization of farmers in Oneco township, who are installing a co-operative telephone line.

Lewis Berne of Rochelle, Illinois, general manager of the Ogle County (Ill.) Telephone Company, visited Chicago recently on business connected with the further extension of his company's lines.

F. M. Ferguson, district agent of the Swedish-American Telephone Company, and president of the Wayne (Neb.) Independent Telephone Company, has decided to make Wayne his headquarters.

Col. Frank L. Bills of the Sioux City (Iowa) Telephone Company says the work of connecting up the various Independent company lines of northwestern Iowa and South Dakota is progressing rapidly.

E. W. Burrough, Albert Miller, George C. Stulken and others have petitioned the supervisors of Madison county, Illinois, for a franchise to construct telephone lines over the public highways of the county.

W. R. Lewis, representing the Farmington Telephone Company, who has just completed the installation of a new switchboard at Bonne Terre, Missouri, will install a new system at Flat River, same state.

W. B. Bell has purchased a controlling interest in the Thurman Independent Telephone Company, operating lines from Hamburg, Iowa, to Pacific Junction, and also an interest in the Hamburg Telephone Company.

R. A. Woolridge and Charles F. Wren, through their attorney, Hon. Leigh Clark, have made application to the city council at El Paso, Texas, for a franchise to establish a new automatic telephone system in that city.

Messrs. A. O. Storvick, Barney Cookpeter, Torger Haraldson, Erick Flaskerud, Aslak Haraldson, Emil Stenseth, Narve O. Hagen and O. P. Fosse have organized the Freeman Telephone Company at Freeman, Minnesota.

Attorney J. E. Estes of Sidney, Iowa, has just purchased $3,000 worth of stock in the City Telephone Company, Bell Brothers of Tabor and Miles Sells of Randolph being the other leading members of the company.

A. B. Cousin of Portland, Oregon, is interested in the construction of a telephone line connecting Merlin and Galice. This is part of a system that will connect some of the best mines in the state with the outside world.

F. D. Grissmore and D. E. Elliott are constructing a telephone line forty miles in length in the southeastern part of Daviess county, Indiana, which will cover a portion of country only partially reached by the telephone at present.

T. H. Nevitt of Harrisburg, Pennsylvania, chief engineer of the United Telephone and Telegraph Company, was in Winchester, Virginia, recently making final arrangements preparatory to erecting an entire new plant in that city.

Frank B. Chester, until recently connected with the Chicago Telephone Company, has been placed in charge of the contract department of the Toledo Home Telephone Company, succeeding J. H. Long, who resigned some time ago.

Manager E. C. Odell of the Independent Mutual Telephone Company of Shenandoah, Iowa, has succeeded in completing arrangements whereby the mutual lines from Shenandoah can make direct connections with the lines in Clarinda.

F. C. Toepleman, general manager of the Home Telephone Company at Weldon, North Carolina, is making preparations to install a new switchboard in Weldon, rebuilding all the lines, using cables, and generally reconstructing its system.

J. S. Campbell of Murdock, Ill., has purchased an interest in the Independent Telephone Company at Tuscola, Illinois, and is now giving considerable of his time to pushing the business of the new company, which is putting in a large number of telephones.

W. N. Anderson and A. A. Drennon, proprietors of the Seymour (Mo.) Telephone Exchange, have made arrangements with Johnson & Burdett of Ava, Missouri, to construct a through telephone line from Seymour to Ava, via Cedar Gap and Bryant.

Superintendent W. L. Porterfield of the Home Telephone Company of Ventura, California, with Messrs. Ross and Watkins of the construction department, were in that city recently canvassing the situation with a view to beginning construction work at once.

Dr. Thomas J. Rhoades has been elected president of a new telephone company which has been organized in Pottstown, Pennsylvania, and which will construct a line to Pottstown and Birdsboro. It is the intention to connect at Reading with the lines of the Consolidated Telephone Company.

C. E. Reeves has been appointed manager of the telephone system at Mitchell, South Dakota, formerly owned by Fred B. Elce, but now owned by the Dakota Central Telephone Company. A number of improvements are contemplated, one of which is the installation of a new and larger switchboard.

I. C. Sabin on September 1 stepped down and out as local representative of the Farm and City Telephone Company at Farmer City, Illinois, and assumed the auditorship of the entire system. E. D. Childress, who has been with the company at Clinton for some time, has assumed the post of head electrician.

John S. Culp of Fosterburg, Illinois, representing the Fosterburg Farmers' Mutual Telephone Company, recently appeared before the city council and asked for a franchise to enter the city in order to secure the desired connection for his subscribers. The company has 1,300 subscribers and forms a network about the city.

William Henry McDonough of New York city, editor of the *American Telephone Journal*, and Miss Henrietta Hanford Proctor were united in marriage at the home of the bride, 2409 Colfax avenue South, Minneapolis, Minnesota, September 7. Mr. and Mrs. McDonough will reside at Hotel Spaulding, New York city.

John Hesketh of Brisbane, Queensland, chief electrical engineer in charge of the government telephone system of Australia, was recently in Chicago for the purpose of inspecting the plants of the telephone companies there. He has been sent by his government on a tour of inspection of the telephone systems of the United States and Europe, and will be in this country for two months. Mr. Hesketh expresses himself as highly pleased with the telephone systems which he finds in operation in this country, and says they are far superior to those he has seen in Europe.

William C. Candee, assistant secreary of the Okonite Company, and son of the manager of the company, Captain Willard L. Candee, was terribly injured in a trolley accident in Brooklyn recently. A trolley car, while going at top speed, collided with an ice wagon and the end of the pole striking Mr. Candee in the forehead, fractured his skull, crushed his nose, and drove fragments of his eyeglasses into the side of his right eye. Mr. Candee was immediately taken to the Seney Hospital and it is believed that the prompt operation there and the careful nursing that followed saved his life.

Herbert Rosenow, who for the past five years has been associated with the Eureka Electric Company of Genoa, Illinois, and Chicago, and who is well acquainted and experienced in the telephone business, as well as being widely known to the telephone trade at large, has resigned his position with the Eureka company to take charge of the telephone department of the Rumsey & Sikemeier Company of St. Louis, which firm has recently consummated arrangements with the Eureka people for the exclusive sale and handling of all their well known telephone apparatus in the territory served by the St. Louis market. This department will be handled in conjunction with Rumsey & Sikemeier's electrical supply department, and with Mr. Rosenow's ability and push back of the Eureka goods it should certainly prove a winning proposition for this concern.

IN THE RURAL LINE DISTRICTS

A rural telephone line is being run down the road south of town.—*Huntley (Ill.) Journal.*

The telephone squabble has not been settled as yet.—*Union City News in La Belle (Mo.) Star.*

Mr. Hartford's near Medora, have put in a telephone.—*Buhler Letter in Hutchinson (Kan.) News.*

Mike Hughes has improved his residence by a new telephone.—*Goodfarm Grist in Morris (Ill.) Sentinel.*

They tell me that we will all soon begin to telephone.—*Clam Lake Clippings in Cadillac (Mich.) News and Express.*

The telephone linemen are up in this section of country and we will soon say "hello."—*Fremont (Mich.) News-Indicator.*

Mr. Ira Oves is still trying to put his telephone line through past Cleghorn.—*Cleghorn Chaff in Eau Claire (Wis.) Leader.*

There are 138 farmers' telephone lines in Linn county, this state. How they must gossip up there!—*Keokuk (Ia.) Gate City.*

The crew of men at work on the telephone line at Esmond was bounced and a new outfit hired.—*Sheldon (N. D.) Progress.*

Miss Winnie of the telephone exchange gave some of her friends a pleasure drive Sunday.—*Bennington (Vt.) Banner and Reformer.*

The telephone agent will soon leave for the harvest fields to be gone two months.—*West Darling Dashes in Little Falls (Minn.) Herald.*

Many miles of telephone wire is now being strung throughout our city, there will be lots of "talk" among us.—*Beaver City (Neb.) Tribune.*

Ulysses Delozier has purchased a stock in the Olney-Bellflower telephone line.—*Pine Knot Pickings in Montgomery City (Mo.) Standard.*

The Springside-Bigelow telephone line was "dead" nearly two days last week.—*Springside Sayings in Westmoreland (Kan.) Record.*

Telephoning in Pohocco has been impossible since the storm and some people are very anxious to talk.—*Pohocco Pickups in Fremont (Neb.) Tribune.*

The telephone war on our eastern border has been settled, peace has been declared, and everything is lovely once more.—*Guthrie Correspondence in Gibson City (Ill.) Courier.*

The new telephone line in Northeast Dix is completed, and there are more rubbernecks than some of us have got hay.—*Northeast Dix Dots in Gibson City (Ill.) Courier.*

Charley Retzlaff was in from his farm near Jessie last Saturday. He now has a telephone line to his place and can talk to the outside world at will.—*Cooperstown (N. D.) Sentinel.*

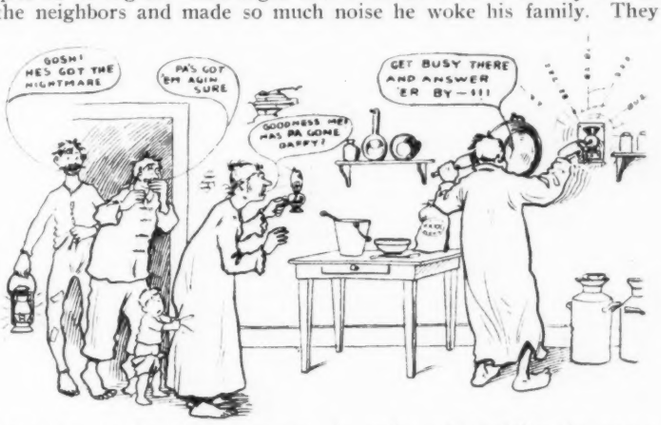
Molino has a new telephone office and a new "up to the minute" switchboard. Clark Williams is the accommodating and obliging hello boy.—*Bean Creek Bits in Mexico (Mo.) Message.*

Henry Thonhoff attended the picnic at Walnut and did not de-

liver meat to-day, so Mr. Harms had to send it out over the telephone.—*Brazilton Buzzings in Walnut (Kan.) Advance.*

Work on the new telephone line is progressing nicely. The poles from here to Little Rock are all set and if not delayed by the shipment of phones, etc., it will not be long before we will ring you up.—*Arrow Rock (Mo.) Statesman.*

Will Crumbaugh has attended so many 'phone meetings and worked so much of late on the new line that he dreams about 'phones of nights. One night last week he tried to call up one of the neighbors and made so much noise he woke his family. They



found him in the kitchen turning the coffee mill, holding the potato masher to his ear and his mouth up to the dishpan, calling "hello." The doctor says he has some hopes of his ultimate recovery.—*Chilhowee (Mo.) News.*

Doc. Robinson was in town the other day and spent a night looking over his telephone interests in Windom. Of course he called to see a first-class newspaper and swap stories and tell yarns about crops.—*Windom (Minn.) Reporter.*

The Michigan Telephone Company finished putting up the poles last Friday. And now we look for the wire gang. Then it will be Hello Central! Give me—Oh, well! well! never mind, you know who.—*Benson Items in Cadillac (Mich.) Democrat.*

Albert Payne was on the war path Friday because the telephone linemen had mutilated his shade trees. Albert will go gunning with a breech-loader and double-shotted weapon the next time that kind of trouble occurs.—*Canton Crumbs in Sioux Falls (S. D.) Argus-Leader.*

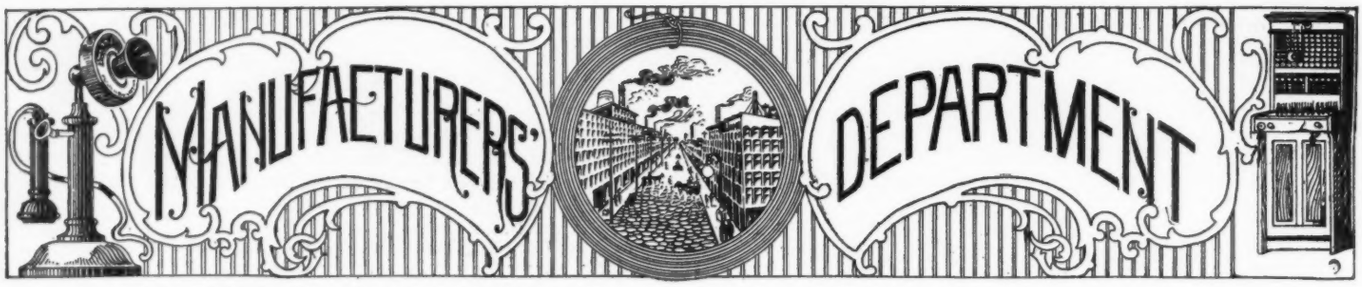
A new telephone line has been run south and west of Hamlin and now our good friends John Creese, Ed Dryden and Robert Mullenger can be talked to from any point in the country. Otto Larsen is talking some of putting in a phone on the same line.—*Hamlin Hunches in Audubon (Ia.) Republican.*

The farmers' telephone, while not in as constant use for gossip, is now one of the indispensable attachments of the farm, and a very useful one. It saves many a mile of weary walking and riding, gets the doctor on stormy nights, and in a thousand ways repays its small cost to the farmer.—*Cuba Chips in Canton (Ill.) Register.*

Complaint is made that the neighbors who do not have telephones impose on good nature. One woman, a Congregationalist, has been bothered so much by neighbors coming in to telephone, that she charges them 10 cents each for the privilege, and gives the money to her church.—*Jug Corners Jottings in Constantine (Mich.) Item.*

The telephone meeting recently held was very enthusiastic and at the outset one would have thought from the surface that the farmers present, whose holdings represented not less than $600,000, were going to belt the globe with a telephone line until a call was made for a subscription of $150 to run a through line from Peck to Riverdale, Belle Plaine and the city of Wellington, and then these yeomen fell down at the measly sum of $75. The farmers are corkers.—*Belle Plaine (Kan.) News.*

The telephone was the means of a rather serious altercation several days ago between Mrs. Chris Onken and Mrs. John Koehler, both living near Guthrie. Their telephones are on the same party line. The trouble led to the arrest of Mrs. Koehler, upon complaint of Mrs. Onken. The cast was tried in this city before 'Squire Sears. The jury disagreed, and finally recommended that the complainant and defendant get together and straighten up their differences, each paying half the costs. This course was finally taken and the difficulty settled.—*Gibson City (Ill.) Courier.*



PAY STATION CASH REGISTER.

The toll or pay station service has become one of the most important parts of the telephone business, and since its inauguration a few years ago has developed into the most popular service now in vogue. Incidentally, it is the most remunerative for the telephone company, as it insures a fixed rate for every connection the subscriber may obtain.

The most essential point of the toll service has, it is claimed, been overlooked by all manufacturers of coin or toll boxes, and this point is the life of the telephone company. Does the company get all the coin placed in the toll box by subscribers when using the telephone? To do this the auditor of the company must have a system where-

25 10 5
AMERICAN COIN REGISTER CO.
PAT. MAR. 15. 04.
CHICAGO, ----- ILLS.
TELEPHONE NUMBER
DIRECTIONS
DO NOT place coin in machine until told to do so by the operator. Have proper coins ready for use. Call as usual, and when operator gives the charge for service, place the correct amount in coin slots, ONE COIN AT A TIME, pulling the lever at the right of the Money box, forward, after EACH DEPOSIT. The receiver must be OFF THE HOOK when money is deposited.
135

PAY STATION CASH REGISTER.

Front Tape.

Back Tape.

by a check is brought in direct from the toll box indicating the exact amount that has been deposited in the box for tolls, just the same as all up-to-date business houses have their checking systems or cash registers, so that they can check up at any time and know that they are getting full returns for services rendered. Laxity in collections ruins more business houses than lack of business.

The American Coin Register Company, 144 East Erie street, Chicago, has just brought out a series of pay-station cash registers, one of which is herewith illustrated, which is complete in every respect. The design is new and pleasing to the eye and is so arranged that the mechanism is separated entirely from the cash box with two separate locks, one for the collector who has access to the money box only, the other for the inspector or repair man, who has access to the mechanism only. In operation, the user, after getting his party, deposits the correct amount, turning the handle after inserting each coin. A system has been arranged making five cents the unit, so that when the user deposits five cents one ring is heard by the operator; for ten cents two rings are heard, and for twenty-five cents five rings. This obviates any possibility of the operator becoming confused as to the proper coin, as is so frequent where different sounds are heard for different coins, and avoids all controversy.

The most essential part of this device is the register, which consists of a coil of paper tape, with consecutive numbers on one side and plain on the other; rolled with this tape is a strip of carbon paper with its printing side next to the plain side of the registering tape. This tape is fed from the upper part through a pair of rolls, one having dashes, crosses and numbers, which are printed on the register tape through coming in contact with the carbon paper. Each dash, cross or figure represents five cents—thus when five cents is put in the machine the bell rings once and the tape is fed in the cash box one number or one dash; for ten cents two rings and two numbers or dashes; 25 cents will ring the bell five times and feed the tape in the cash box five numbers. The crosses on the tape are so arranged that the amount can be easily counted by tens; the number on the back of the tape with the dashes indicates the number of the telephone or toll box, so that the auditor can identify the telephone from where the collection and tape came.

Another novel feature is the revolving cash box, cylindrical in shape and large enough to hold a considerable amount, with no possibility of stacking or plugging up, as so frequently happens to other machines.

In making a collection from one of these instruments the collector unlocks the cash box from one side and turns it part way around, bringing the open side of the cash box to the front and at the same time cutting off the tape that has been fed into it. This act also closes the upper works, so that no tampering can be done. The tape on counting will tally exactly with the money and must be taken to the office with the collection. The consecutive figures on the tape serve two purposes—one, so that the subscriber can see about how his telephone is running, and the other, and most important, to prevent any manipulation, such as tearing off a piece of the tape; as the first number on one collection must correspond with the last number on the previous collection.

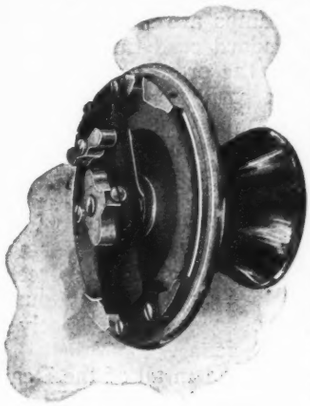
The advantages of these devices are: First, it protects the subscriber and shows by the numbers through the small glass-covered aperture just how many times the telephone has been used, and the numbers on the tape will tally exactly with the amount that has been deposited in the box; second, it protects the collector from any suspicion of being dishonest, as he brings in an absolute record with his collection; third, it protects the telephone company and insures the exact returns being brought in from each pay-station.

Experiments and tests under various conditions, covering more than a year and a half, have been made in Chicago with more than satisfactory results, and the company is now

preparing to manufacture their pay-station cash registers on a large scale. Beside the three-slot toll device they will manufacture registers for nickel and measured service.

DEAN TELEPHONE APPARATUS.

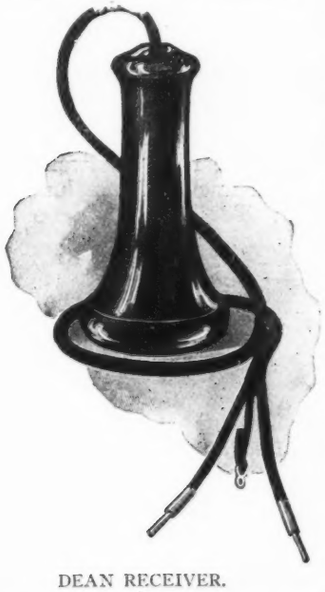
As a new concern, launching out into the manufacture of a complete line of telephone apparatus, the Dean Electric Company, Elyria, Ohio, has laid much stress on the proper design and construction of the transmission apparatus, realizing that this is the vital point in modern telephony. The advent of strictly long-distance lines has brought to light the fact that the present apparatus is not properly designed to carry on perfect long-distance conversations. There are many remedies propounded, but all concur on one point, and that is in the improvement of the talking apparatus. This the Dean Electric Company has accomplished, and to an extent which is far beyond their fondest hopes. Not only have the transmitter and receiver been developed to their highest efficiency, but they are made in such a manner as to keep these properties indefinitely. The accompanying cuts show several views of the Dean transmitter and receiver, a complete description of which follows:



DEAN TRANSMITTER.

DEAN TRANSMITTER.

The new Dean transmitter consists of the various parts contained in the solid back type instrument, but is made in a much simpler and more logical shape so as to obtain the maximum transmission effect. The electrode cup is the most important part of the transmitter and great care is exercised in making its parts absolutely accurate within a fraction of a thousandth of an inch. The cup proper and rear electrode holder are turned from solid brass and finished to this micrometer precision on a delicate watch lathe. The uniformity of any high-grade transmitter depends on the accuracy of the parts and material of the cup; otherwise only an occasional instrument would give the best results.



DEAN RECEIVER.

The bottom of the electrode cup forms the front electrode of the transmitter, while the rear electrode is mounted on a stud which can be clamped by an adjusting screw located in the bridge. A special grade dense granular carbon forms the resistance medium between the electrodes. The cup is sealed from moisture by a mica disc, which also serves as an auxiliary diaphragm and tends to add to the resilience of the vibrating parts.

PARTS OF DEAN TRANSMITTER.

The body of the cup and mica clamping ring are heavily plated with gold to prevent oxidization and to give better electrical contact with the connecting parts. The complete cup constitutes a unit and in making a change from local to common battery is the only part which it is necessary to replace.

The diaphragm is made from aluminum and is provided with a circular opening in its center large enough to admit the entire bottom of the electrode cup. A shoulder is formed around this opening, which serves to stiffen the center of the diaphragm, as well as to form a seat for the electrode cup. The latter makes contact with the diaphragm through its mica clamping ring, thereby leaving the entire bottom and sides of the cup free to vibrate. The contact between the cup and diaphragm is secured by a double tongued spring projecting

PARTS OF DEAN RECEIVER.

from the under side of the bridge. This spring also forms a "damper" for the diaphragm and effectually takes the place of the two springs commonly used. It is well known that a diaphragm supported, but not confined at its edges, has certain dead zones in its travel which greatly interfere with its proper action. The well known dampering springs are placed by guess to counteract this lost motion, but in the Dean transmitter the center of the diaphragm is given a symmetrical strain at all times, which exactly accomplishes the purpose.

The bridge is made from a rigid, accurately finished metal casting, and is securely fastened to the front casing of the transmitter by four screws. The two bosses on the outside of the bridge form the binding parts to which the cords are attached. The middle boss also serves as a support for the back electrode stud and is provided with a screw for clamping the same. This screw is not set until the transmitter has been assembled and the instrument talked into, thereby allowing the parts to self-adjust by assuming a balanced position. This is the position which will give the highest efficiency and render all further adjustment unnecessary. The "U" shaped spring located on the inner side of the bridge is electrically connected to the second boss and carries the current to the transmitter cup. From this point the circuit is through the front electrode (bottom of cup) and granular carbon to the rear electrode, and thence through the stud to the middle boss and out. All the metal parts included in the circuit are thoroughly insulated from the casing,

rendering it impossible to obtain annoying shocks through personal contact with any exposed portion of the transmitter.

It will be noticed that the front of the transmitter has not been used as a sign board to advertise the maker's business. It is, however, provided with a removable card-holder which is made to clamp securely between the front and mouthpiece. This card-holder is keyed so that it can never assume a tilted position, even if the mouthpiece becomes loose. The card provided with the holder is protected by a celluloid cover, and is large enough to contain the name of the telephone company and simple directions for the use of the telephone, or the subscriber's number. This is the most conspicuous place on a telephone and should be used to the telephone company's advantage.

The action of the transmitter is direct, as the voice is concentrated by the mouthpiece directly on the bottom of the electrode cup, which is made thin and forms the front electrode. In all other types of solid back transmitters now on the market, the voice has to reach the resistance chamber through the agency of the diaphragm and not only loss of much energy results, but articulation is impaired. This direct action on the front electrode is supplemented by the larger vibrations of the diaphragm itself, which causes the entire cup to move with it, giving rise to great volume in transmission.

As previously mentioned the cup is held firmly in contact with the diaphragm by the double-tongued spring so as to take up all of its motions, excepting any abnormal or violent movements which might damage the transmitter. The only big movement of the diaphragm which is liable to cause damage is a forward movement in the same direction as the action of the dampering springs. In case this should happen through accident or intent, such as applying the lips to the mouthpiece and exhausting the air, in an attempt to pack the transmitter, the diaphragm will leave the electrode cup and no damage result. In this case the cup is held against the tension of the springs by its auxiliary mica diaphragm. It is absolutely impossible to "pack" this transmitter purposely, nor will it pack through continued use. This is partly due to the feature just described and to the constant agitation of the mass of granules.

The Dean receiver is composed of two main elements: First, the enclosing shell, consisting of the body and ear cup; second, "the operative receiver unit," which contains all of the working parts rigidly assembled so as to be operative, independent of the enclosing shell. The shell is used primarily as an enclosing case for insulating and giving a finished appearance to the receiver. The receiver will work without the case, and should the body or cap of the shell become accidentally broken it will not disable the instrument. However, the operating parts of the receiver give the highest acoustic efficiency when encased in the shell, as the vibrations of the diaphragm are then concentrated and forced in the proper direction to give the maximum effect to the listener. The operative part of the Dean receiver is built on straight lines and is designed to be perfectly interchangeable. The parts go together without any fitting or adjusting and no chance for adjustment is provided. Adjustment is not necessary in a properly designed and constructed receiver and its absence cuts out a maintenance item of no little importance.

An accurately finished non-magnetic metal casting forms the base upon which all of the working parts are securely fastened. This casting is cup-shaped with a bridge portion made to project between the pole pieces and magnets. The latter parts are securely fastened to it by a tightly fitting bolt which passes through all of the members and firmly holds the pole pieces in a definite position relative to the diaphragm. Alignment of the parts are secured by centering guides formed in the casting. The cup-shaped portion of this casting encloses the bobbins, while the diaphragm is clamped by a mortal ring to its outer flange. The front of this flange presents an accurate, plain surface for the diaphragm to rest on, while the clamping ring is lined with a thin cushion so that when tightly screwed into place the diaphragm is rigidly held around its outer edge without any uneven distortion of its body. This leaves it free to respond accurately to the weakest or strongest transmission.

The bridge portion of the finished casting constitutes a support for the binding clamps, which are thoroughly insulated from it. These binding clamps are so constructed that they will tightly grip any standard cord tip when the binding screw is set, or will clamp the ordinary tinsel end or loop end of a cord. The strain cord is arranged to be fastened to the yoke of the magnet, thus removing all strain from the terminal ends of the cord. Each binding clamp has a terminal end which projects into the cup and to which the receiver windings are soldered.

The cup-shaped portion of the finished casting is provided with a series of apertures designed to permit the air vibrations set up by the diaphragm to be communicated freely to the column of air within the receiver shell. This is found to greatly improve the acoustic properties of the receiver and thereby increase its receiving efficiency.

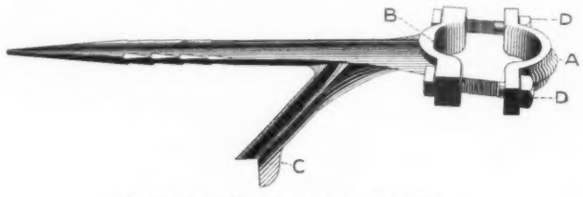
One of the novel features incorporated in all of the Dean wall telephones is a removable lever hook switch. In the regular construction the hook lever is subject to much damage in shipping and handling, and to avoid this the lever is made removable and need only be inserted in position after the telephone instrument is mounted on the wall. It can then only be removed by opening the lid of the telephone box, as the release is located on the body of the switch.

The Dean common battery telephones are provided with an entirely new design of talking circuit. The principle of the Wheatstone bridge is employed to keep the direct current flow from the receiver, while all of the voice currents which are alternating in effect are forced, by a combination of retardation and low resistance, located in the arms of the bridge, through the receiver. Thus the receiver is practically in the line circuit, and therefore receives the full transmission current without any such losses as are produced when induction coils or condensers are used in series, as in all other makes of common battery telephones. This retardation and resistance are wound on one spool, which is so designed that only two terminals are necessary to connect it to the telephone circuit. The wiring of the common battery telephone is thus made extremely simple.

In addition to the apparatus previously described the Dean Company makes a complete line of telephones and switchboards for both magneto and common battery service.

"SECURITY" POTHEAD BRACKETS.

The old style of pothead block is not as innocent as it looks; it costs money; it is never on hand when wanted; never adjustable; it is special and a lineman must hunt a piece of lumber and make each one. The lumber is the only



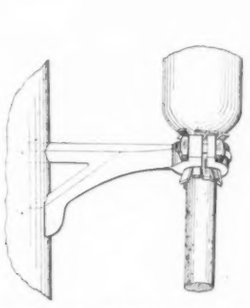
"SECURITY" POTHEAD BRACKET.

cheap thing about it and the other expenses make the finished block cost much money.

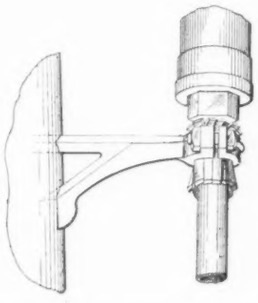
The method of fastening wooden blocks is very unsatisfactory. Linemen must and do stand on something, and these blocks break under their weight. A wooden block which is one year old and still solid is a novelty in most

exchanges. The method of fastening the cable to the wooden block is always rough and not satisfactory, but cannot be bettered unless the block is discarded.

The "Security Bracket," manufactured by the F. Bissell Company of Toledo, Ohio, is of malleable iron. Its attachment to the pole is easy. A three-eighths inch hole is started three or four inches deep, into which is driven a barbed shank. Remove the outside clamp "A" and you will find a head "B" on which to pound. Drive it in until the foot of the brace "C" enters the pole; hit "C" with your hammer to make sure of a firm step. Put the cable in the bracket and put clamp "A" around it, loosely fastening the two



BRACKET IN POSITION—OLD STYLE POTHEAD.



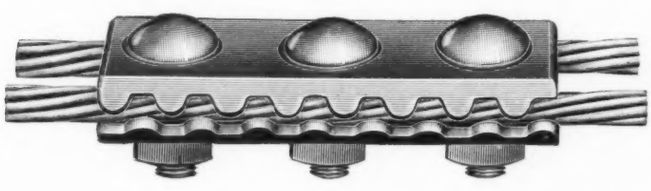
BRACKET IN POSITION—SECURITY POTHEAD.

bolts "D." The nuts come against the shoulders, and face in with the heads facing out, which makes a neater job. Slip shims of lead or leather between the bracket and the cable so that the lead cable is cushioned; tighten the bolts "D" firmly, but not enough to crush the cable. The clamp should be put around the cable itself and the pothead should be just above it. This puts the strain on the lead sheath and not on the pothead. If it does slide down no particular harm is done, although the first hold is better.

Linemen can swing or stand on this bracket without injury to it or to themselves. It neither breaks nor decays. It is altogether permanent and in appearance is a great improvement over the clumsy block and the saving in expense is considerable. Samples will be sent anywhere subject to approval. Two sizes are made, one with an opening of one and five-eighths inch and the other opening two inches; deducting one-eighth inch on each side for the shim gives a maximum cable capacity of one and three-eighths and two inches respectively. Both may be shimmed to fit smaller diameters.

COOK'S UNIVERSAL GUY CLAMP.

Frank B. Cook, Chicago, has apparently given the lie to the pessimist who stated that "there is nothing new under the sun," for Cook's Universal Guy Clamp is, without chance for an argument, a most radical departure from the accepted



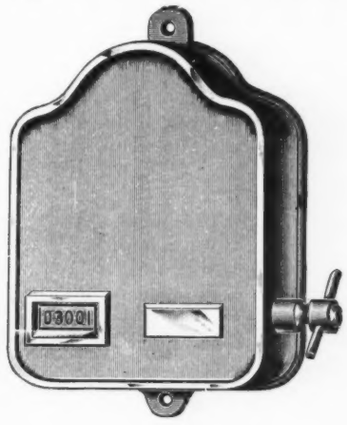
types of guy clamps. It really seems remarkable that no one had the temerity (or shall we say originality?) to depart from the old idea long ago, but the fact remains that Mr. Cook was the first one to make the leap. The result has been an eye-opener to all users of guy clamps.

Cook's "Universal" not only takes any size strand, from 3-16 to ½ inch, but when it once takes them it holds them. One of Cook's circulars is a reproduction of the Armour Institute's record of some comparative tests which they made of several well known types of clamp, and the figures are startling. They show that Cook's will hold from two to three times as much of a load as the best of the others. Telephone, telegraph, light and power companies have evidenced their appreciation by sending some big orders. The Home Telephone Company of Los Angeles, California, recently placed an order for 5,000, the American Steel and Wire Company, 3,000; the New Long Distance Telephone Company, Indianapolis, 500; the Buffum Telephone Company, Louisiana, Missouri, 300; the Pacific States Telephone and Telegraph Company, San Francisco, 300; the Sheboygan Telephone Company, Sheboygan, Michigan, 500; the Indianapolis Light and Power Company, 8,000; the Empire Electric Company, San Diego, California, 5,000. A canvass of the supply houses shows that practically all of them are handling Cook's "Universal." It appears to be a good thing, and it likewise appears that Cook is "pushing it along."

BAIRD PAY-STATIONS.

The Baird Manufacturing Company of Chicago reports a steadily increasing demand from all parts of the country for the several types of its well known telephone pay-stations and time stamps. At the present time there is such an

NO. 28.



NO. 7.

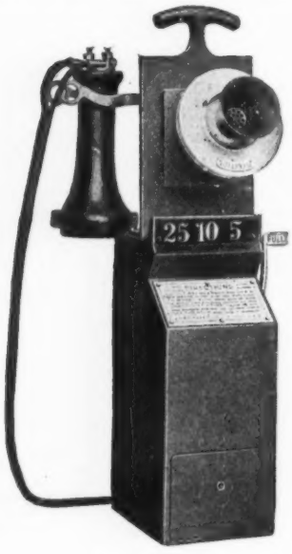
unprecedented demand for the Baird goods that the company finds it extremely difficult to keep up with the orders. The most largely used and most popular Baird pay-station is the No. 13, which we illustrate herewith. This machine

NO. 9.

NO. 10.

is provided with a mounting plate by means of which it can be attached to either style of telephone—common battery or magneto. This new model pay-station has every feature which has been found to be desirable for toll service. Its low cost ($8) enables telephone companies to use it extensively at great profit to themselves. The strong features in this machine are loud signals, a rejector pocket for returning coins deposited in the wrong slot by mistake, a

"flipper," by means of which all the slots are closed when a coin has been placed in the machine, and remains there until the lever is pulled and the signal given, a muffler on the cathedral gong shuts off the signal on the return of the lever, a combination lock on the cash drawer is as secure as



NO. 130.

NO. 24.

a safe combination, a large coin capacity is provided for, and the method of operation is so simple that the directions card is hardly necessary.

For central energy telephones a similar type of machine, known as the No. 136, is arranged with a transmitter base attached to the front. This type of machine has all of the features above mentioned in connection with the No. 13 pay-station description, but its peculiar merit lies in the loud and clear signals given by attaching the transmitter directly to the front of the machine.

Other popular types of Baird pay-stations are the No. 24

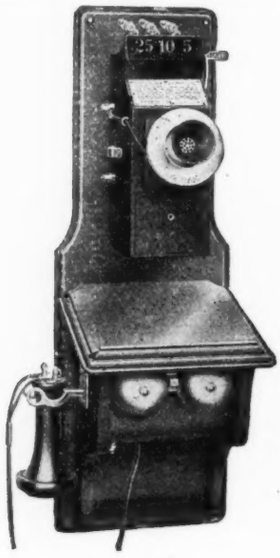
NO. 50.

NO. 13.

and No. 25 wall cabinet machines having four and five slots and an extra large coin capacity. These machines have all of the fine features of the No. 13 pay-station, but are peculiarly desirable for use in booths, as the handsome woodwork makes a fine appearance. The case of this machine is a compartment for dry batteries to be used on magneto telephones.

The No. 34 and No. 35 desk cabinet machines are very handsome instruments intended for booth service and have all the features previously described. This case, while usually made of oak, can also be supplied in solid mahogany.

Another type of pay-station which is finding increasing favor is the portable restaurant set, of which the Baird company make two different styles. The No. 130 portable restaurant and hospital set is very compact, as it has a switch-hook on the top of the machine and the transmitter is attached to the front of a mounting plate on the top. The



NO. 136.

NO. 34.

No. 135 portable restaurant and hospital set is designed for use of an ordinary desk telephone mounted on wooden baseboard in connection with a No. 13 pay-station fitted with a solid steel back and a handle on the side for carrying.

The Baird No. 7 call register is a simple and durable mechanical device for registering calls on the subscribers' telephone. There are several other styles of counters made by the Baird company relating to the same geenral principle.

For peg counts the Baird No. 9 counter is a very popular device. This instrument registers up to 100,000 and then

NO. 135.

returns to zero. It is thoroughly reliable and large quantities of them are used by both Bell and Independent telephone companies.

Another type is the Baird No. 10 counter, which has a mounting socket for attaching to the switchboard. This instrument records up to 1,000 and then returns to zero, but it has set nuts by means of which it can be set back to zero at any time.

The Baird telephone time stamp is a thoroughly reliable instrument costing much less than other time stamps on the market, but is guaranteed reliable and satisfactory.

Last, but not least, is the Baird No. 50 prepayment coin

collector, which is a very strong, durable and reliable rapid service machine for nickels, designed to overcome all the weak points in other prepayment machines which have been placed on the market. This machine needs to be seen to be appreciated. A full description of its method of operation can be obtained direct from the company.

UNDERGROUND CONSTRUCTION ACROSS THE NEWARK MEADOWS.

An installation of underground conduit, which from the standpoint of speed of construction, has aroused considerable interest among electrical engineers in the east, is now being

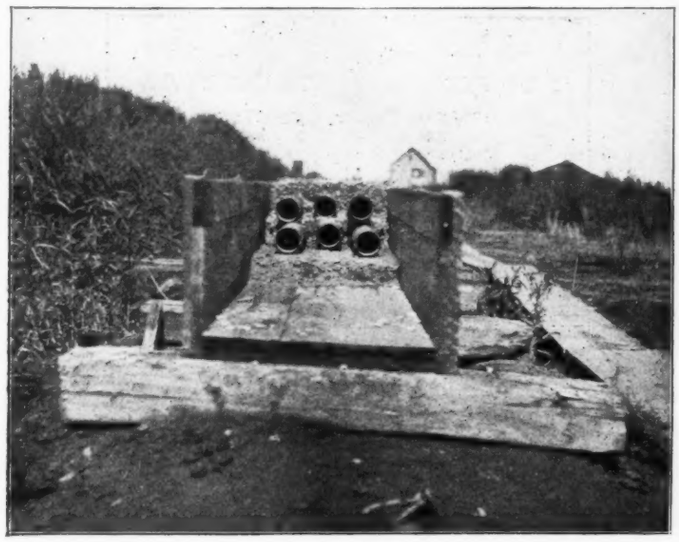


FIG. 1.

made across the Newark Meadows, between New York and Newark, New Jersey, by the United Electric Company of Newark. Over 260,000 feet of conduit will be required to complete the work now under construction.

The main line of this system is being laid thirty ducts

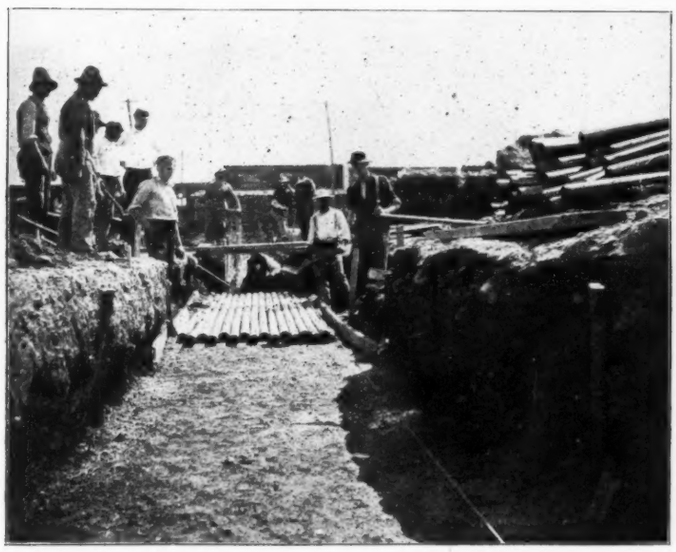


FIG 2.

in parallel, five layers each of six ducts, and from this lead is being constructed branch lines consisting of six ducts each. (See Fig. 1.) During the progress of the construction of that portion of the installation now completed various difficulties were encountered that greatly delayed the work. Chief among these was that caused by the extremely wet or marshy condition of the ground through which it was necessary to lay the conduit. This difficulty was overcome by the use of an electrically-driven hydraulic pump, which kept the trenches free from water while the work was in

FIG. 3.

progress. In one portion of the Meadows, the ground was so soft that excavation was found to be impossible, thereby making it necessary to build a trough on the surface of the ground, through which the conduit was laid, after which

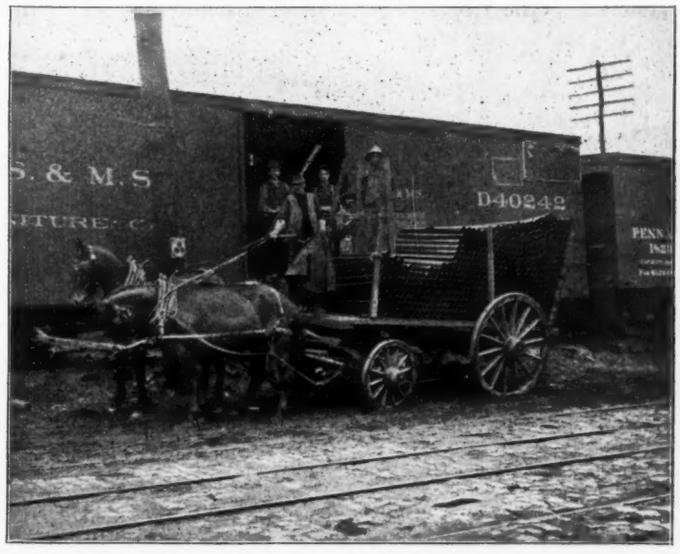


FIG. 4.

the trough was filled with concrete. (See Fig. 1.) In constructing the main line at one point a large water-pipe was encountered about three feet below the surface, to avoid which the conduit was laid in two layers, of fifteen ducts each. (See Figs. 2 and 3.)

Record time has been made in the laying of that portion of the system now complete, one man in the trench and two helpers above laying the conduit at the rate of 12,000 duct feet per day. In one instance, two men in the trench and three helpers above laid 7,500 duct feet in four hours.

In transporting the conduit from the cars to the ditch a great amount of time and labor was saved by its being possible to load and haul, easily, 3,500 feet of the material on a one-team truck. (See Fig. 4.) Of the total amount of

conduit used in the construction of this system, the loss from breakage and all other causes was less than one-tenth of one per cent.

The rapid construction of this system, according to the men in charge, was made possible largely by the type of conduit used. This conduit is manufactured in five-foot lengths, and is provided with automatically-turned socket connection at the ends, thus allowing great speed in laying. The conduit is extremely light, the 3-inch socket joint type weighing approximately 1.2 pounds per foot. This conduit is manufactured by the Fibre Conduit Company, Orangeburg, New York.

THE LATEST COOK PROTECTOR.

A prominent telephone engineer, who was attending the International Congress of Engineers at the Louisiana Purchase Exposition, recently remarked that he considered the self-soldering heat coil one of the greatest advances that had been made in telephony in recent years. Too many telephone companies, he said, failed to realize the importance and necessity of proper protection against sneak currents, and the subject is one which is generally given very little attention Many companies with expensive switchboards have depended entirely upon the totally inadequate protection of mica fuses—a form of protection which has proved disastrous and expensive to many of them. Mica fuses furnish no protection whatever from sneak currents, as a quarter ampere fuse will easily carry one ampere for an indefinite period; this current

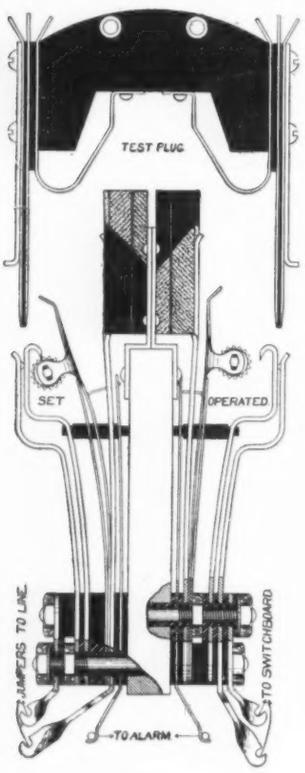


FIG. 1.

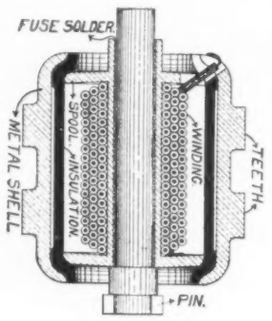


FIG. 3

is enough to set a switchboard on fire in two minutes.

The illustrations shown represents what is claimed to be the best form of protection that can be devised, or at least the best that has been devised thus far. It is manufactured by Frank B. Cook, Chicago, and is styled by him No. 444. This protector is equipped with carbon lightning arresters and self-soldering heat coils. The self-soldering coil possesses many advantages over the old type; it resolders itself immediately after operation. Consequently, as the coils do not have to be replaced, there is no cost of maintenance. From the diagram shown in Fig. 1, it can readily be seen that it is a very simple matter to restore the coils to position after operating. The test plug shown in the diagram is designed to permit of testing the different circuits and conditions by one insertion of the plug, without removing the heat coils or lightning arresters.

In Fig. 2 is shown a diagram of the test plug and testing circuits. Every operator will appreciate the great convenience of this testing arrangement. The heat coil itself (Fig. 3) consists of a toothed shell enclosing the spool, the whole being soldered to a stationary pin by a layer of solder fusible at a low temperature. An abnormal current passing through the winding of fine wire melts the solder, thus allowing the body of the coil to turn on the pin. This releases the circuit controlling spring and opens the circuit through the heat coil. The solder cooling, again secures the body of the heat coil to the pin. The circuit controlling spring can then be reset in position, engaging the teeth.

The heat coils are wound to a very low resistance, thus eliminating the necessity of working through a high resistance. They will operate instantly on a current four times as strong as the current which is required to operate the coil;

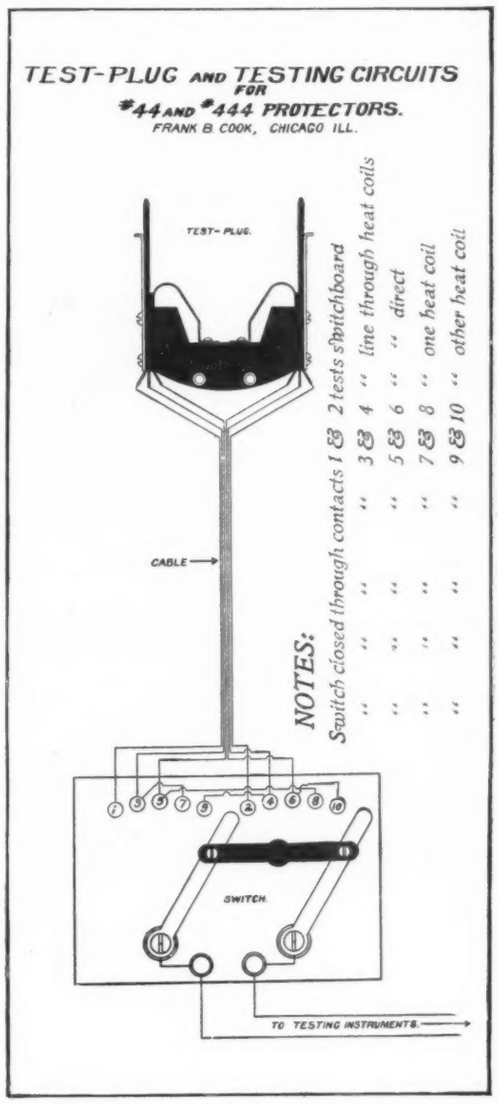

TEST-PLUG AND TESTING CIRCUITS FOR #44 AND #444 PROTECTORS.
FRANK B. COOK, CHICAGO ILL.
TEST-PLUG.
CABLE
NOTES:
Switch closed through contacts 1 & 2 tests switchboard
" " " 3 & 4 " line through heat coils
" " " 5 & 6 " " direct
" " " 7 & 8 " one heat coil
" " " 9 & 10 " other heat coil
SWITCH.
TO TESTING INSTRUMENTS.

FIG. 2.

in other words, a coil wound to operate at a quarter ampere will operate instantly on one ampere. Cook's coil, being self-contained—that is, being completely encased in the shell—has no solder part exposed to the atmosphere; this minimizes the danger of oxidization.

The heat producing coil is wound directly around the fusible solder; by this method of construction the heat is concentrated and none is lost. As the solder is fusible at a very low temperature, any foreign current will melt it almost immediately, and the coil will operate before the current could possibly burn the winding.

It will be noticed that the coil turns through only a very small arc of a circle. The resiliency of the solder allows

it to stretch a little when the coil turns, and does not break the solder away from its connections. This insures quick and permanent resoldering.

Cook's coil requires no handling at all, as it stays in place when once put in. It is unnecessary to reverse it or to turn it in any way in order to set it in position for operating again, after it has operated. In the preliminary tests, coils were operated something over 2,200 times, which is probably over ten times as many operations as any coil would be subjected to in actual use. No trouble man would be apt to allow 2,200 cases of trouble on the same line, so the life of the coil is practically indefinite.

The compactness of Cook's No. 444 protector is well illustrated in Figs. 4 and 5. These illustrations show a bank of 20 pairs of protectors, the upper eight coils on the right-hand side being shown in closed position after operating. This protector is furnished with Cook's type "L" main distributing frame, and can be furnished for any capacity. The distributing frame itself is sectional in construction; additions to the frame can be made, one vertical section at a time, and the protector equipment can be added in banks of 20 pairs whenever desired. To the exchange manager who is attempting to provide for the future, this plan of construction is invaluable. To those interested, Mr. Cook will be glad to furnish further information on request, and is also willing to furnish a list of many exchanges, large and small, which are now using the No. 444 protector.

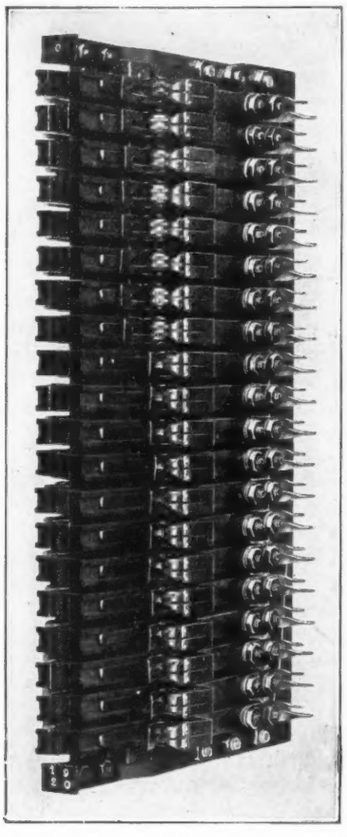


FIG. 4

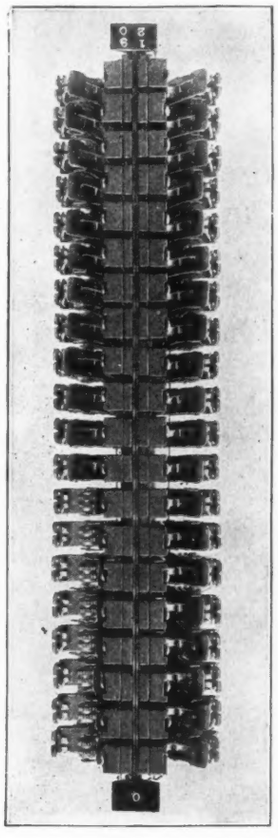


FIG. 5.

The opinions of those who have had experience with the apparatus, and to whom it has furnished the best of satisfaction, are the most valuable testimonials which can be given in its favor. The man who is looking around for the best he can get, and who "wants to know," is always glad to get his advice from the man who already knows from experience.

MILLER ROLLER ANCHOR EYE.

G. H. Miller, well known in connection with the Miller Anchor Company of Norwalk, Ohio, has invented a new roller anchor eye, which seems to fill a long felt want. Mr. Miller has this to say in regard to the anchor eye and its use:

"Competent engineers and experienced linemen who have tested this roller eye have everything to say in praise of it. They recognize its value as an anchor eye, as with it they can draw their cables taut with half the power required in the old way."

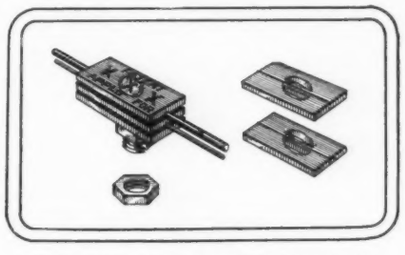
This eye acts as a movable pulley when in use, and this, in the laws of mechanics, adds one-half to the power. The greatest saving power is shown in cable work, where the greatest saving power is needed. The Miller anchor, which is fast gaining popularity among dealers and users of these goods, is rendered more desirable than ever by the addition of these eyes, which can be obtained only of the above named company and its agents. The device has recently been patented, and the eyes are manufactured by no other company. Inquiries are promptly answered and prices readily given on request.

XXX TEST AND WIRE CONNECTOR.

The XXX Test and Wire connector, illustrated herewith, is a device which is just being placed on the market, and has proven to be most satisfactory wherever used. Already a number of Independent telephone companies are using them in large numbers.

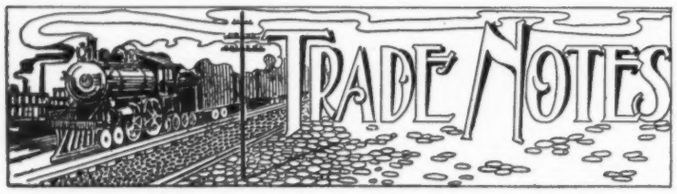
A brief description will serve to explain why this connector is sure to be universally used.

They take any desired gauge of wire used in ordinary telephone or telegraph construction and grip securely wires main line and can be slipped under and secured to a through more wires. They are smaller and lighter than most connectors on the market and it is claimed accomplish more. They can be used to connect a branch wire to a continuous line for making branch connections without disturbing the circuit after it has been made. They can also be used at the poles on individual telephone circuits, where drops are made to the subscriber's station in place of a twisted joint, and will accommodate drop wires any size smaller than that used on the main line, saving enough or more than the price of the connector, besides having a test joint. Connecting two or more wire ends is readily accomplished by their use.



XXX TEST AND WIRE CONNECTOR.

The XXX Test and Wire Connector is manufactured by the XXX Electrical Supply Company, Chicago, who will be pleased to send samples and prices to any interested party. The company also has several other devices to be used on line construction, which will eliminate expense and labor.



THE ROLFE ELECTRIC COMPANY, Rochester, New York, has been incorporated at Albany with a capital of $150,000.

J. FRANK BUTTERFIELD, Chicago, has been awarded the contract for all construction work and extensions to the plant of the Rushville Co-operative Company, Rushville, Indiana.

THE STERLING ELECTRIC COMPANY, Lafayette, Indiana, recently completed a large export order for London, England. This company reports a steady growth in export business.

THE MANHATTAN ELECTRICAL COMPANY, New York and Chicago, has its new catalogue, No. 18, ready for distribution. It is complete in every way and will be mailed upon application.

L. B. ALLEN & COMPANY, Chicago, are distributing a neat little booklet, entitled, "Soldering Sense," which contains some good pointers for anyone using solder. It will be sent upon application.

THE WESCO SUPPLY COMPANY, St. Louis, has issued its house publication, *The Live Wire*, for September. It is brimful of bright, breezy bits and is in every way worth while and a credit to the company.

A. J. COX & COMPANY, sales agents for a number of concerns catering to the wholesale and retail telephone trade, have removed from 1129 First National Bank Building, to 1209 Stock Exchange Building, Chicago.

THE NATIONAL BATTERY COMPANY, Buffalo and New York city, owing to the large increase in its business, will add extensive additions to its factory. Telephone batteries are among the most important of its products.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, calls the attention of linemen, managers, electrical engineers, and all persons interested in line-construction work, to the illustrated article on its roller eye elsewhere in this issue.

THE T. M. PARTRIDGE LUMBER COMPANY, Minneapolis, which is a heavy producer in Minnesota, is offering special inducement on six and seven inch 25 and 30 foot poles. They have a big bunch of these sizes that must be moved this fall.

AT A MEETING of creditors of the Anders Push Button Telephone Company, New York city, held at the office of Peter B. Olney, referee in bankruptcy, John Brooks Leavitt was elected trustee, and six claims, aggregating $6,300, were proved.

THE S. H. COUCH COMPANY, Boston, is sending out a bulletin on farmers' line switchboards. This company reports a steadily increasing demand for its toll line switchboard. Printed matter describing this apparatus will be sent upon request.

"COPPER GOSSIP," issued by the National Conduit and Cable Company, New York city, contains in its last number much to engage the attention of those interested in the copper market. A copy of the pamphlet should be in the hands of every telephone man.

THE MOUNTAIN STATE ELECTRICAL COMPANY, Wheeling, West Virginia, has recently received a nice contract from the Mutual Telephone Company of Des Moines, Iowa, for its cable terminals, together with several other orders from small companies over the country.

THE CHICAGO INSULATED WIRE COMPANY, Chicago, has constantly on hand a complete stock of weather-proof, annunciator, and magnet wire cables and galvanized strand at its St. Louis warehouse, and states that it is in a position to make prompt shipments from that point.

THE CENTRAL TELEPHONE AND ELECTRIC COMPANY, St. Louis, is now installed in its new factory, is enjoying the best trade in its history, and is prepared to handle greatly increased demands for all kinds of telephone apparatus. Printed matter fully describing same will be sent upon application.

THE KNICKERBOCKER CONSTRUCTION COMPANY, New York city, has been awarded the contract for the installation of 5,000 feet of underground cable for the Buffalo, New York, fire department. The cable is being manufactured by the American Electrical Works of Philipsdale, Rhode Island.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, N. Y., and Chicago, has closed contracts for switchboards for the Pfister Vogel Leather Company and Davis & Means, Delmar, Iowa; Fayette Telephone Company, Fayetteville, Tex.; Shelby Telephone Company, Shelby, Mo.

SECRETARY W. R. GOODMAN of the Chicago Fuse Wire and Manufacturing Company has taken up his personal headquarters at the New York office of the company at 853 Broadway, from which point he says that company expects to do an increasing business in its familiar fuse wires, enclosed fuses and blocks.

THE UNITED STATES RAILWAY SIGNAL AND TELEPHONE COMPANY, St. Paul, Minnesota, has been incorporated with a capital stock of $1,000,000. This company will engage in the manufacture of what is known as the Johnson-Ballard electric signal. James A. Ballard, Horatio A. Johnson and Angelo H. Sprague, St. Paul, are the incorporators.

W. W. SMYTHE, JR., western manager of the Fibre Conduit Company, Orangeburg, New York, states that he has secured the order for all underground conduit and distributing-pole bends necessary to the construction of the new Independent telephone system at Sioux City, Iowa. Approximately 100,000 feet of conduit will be required for this installation.

THE AMERICAN ELECTRIC FUSE COMPANY, Chicago, directs attention to its No. 402 protector, which is made to be used outside, the dome and bracket being galvanized and will not rust. The base is of porcelain and the wires enter from the bottom through binding-posts. The protector is easy to install and may be placed on the pole or on the side of the house.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, Illinois, is distributing a new and interesting work, entitled, "Independent Telephone Practice." It contains reliable telephone information, statistics, data, etc., that make it invaluable to every telephone man. It was compiled by two of the best known men in the Independent field—I. J. Kusel

and S. E. Dobbs. A request will bring one of the books to anyone interested.

THE CONTROLLER COMPANY OF AMERICA, Chicago, is showing at its exhibit in the Electricity Building at the World's Fair, a coin device for the automatic telephone. This is the first practical device for this service and is attracting considerable attention. The device is shown attached to an automatic telephone connected with the system working in the Electricity Building.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, reports having received a number of inquiries from foreign countries, including Mexico, Spain, Greece and Japan. Negotiations are under way for the sale of the Japan patent. A test was recently made by the Japanese government at Osaka, Japan, and was attended with the best of results, the Japanese having only words of praise for the anchor.

H. A. SWANSON, Chicago, has just purchased $200,000 worth of the Globe Automatic Telephone Company's stock. All indebtedness of the company has been paid to date and a double force of factory hands is being employed to take care of the rapidly increasing business. J. E. Norling and August L. Craig also have substantially increased their investments. Quotations for materials and supplies in large quantities are invited.

THE GEMMILL TELEPHONE MANUFACTURING COMPANY has erected a large factory building in Orrville, Ohio, and about the first of next May the company will get the large brick building in that city, formerly used by the Schantz Organ Company. The office force consists of F. H. Lincoln, manager, Orrville; Mr. Boner, clerk, and Miss Grace Moseley, stenographer. The company is putting in a new boiler and engine and machinery and will soon have the plant in operation.

THE WILLIAMS TELEPHONE AND SUPPLY COMPANY, Cleveland, having outgrown its old place of business, has moved into more commodious and appropriate quarters at 73-79 Central avenue, and extends a cordial invitation to all its old and new friends to call and inspect its new business home. The growth of the Williams company has been sure and steady for a number of years past, and today it occupies an enviable place among Independent telephone manufacturing companies.

THE AUTOMATIC ELECTRIC COMPANY, Chicago, has just issued two attractive new booklets—"What They Say About the Automatic in Grand Rapids," and "What Portland, Maine, Thinks of the Automatic Telephone"—which it is mailing to prospective customers. Both are illustrated, and will be sent to anyone interested upon application. Supplementing the Grand Rapids booklet is the latest annual report of the Citizens' Telephone Company of that city, which is a flattering testimonial for the automatic.

THE WESTERN TELEPHONE MANUFACTURING COMPANY, Chicago, is complainant in a suit brought against the Williams-Abbott Company of that city in the United States Circuit court for an alleged infringement of a patent governing the manufacture of combined annunciators and spring jacks, used in connection with telephone switchboards. A permanent injunction is asked for by the plaintiff, compelling the defendant company to cease making and marketing the articles said to be covered by a patent held by the plaintiffs.

THE AMERICA CONDIUT COMPANY, Chicago, and New York city, popularized itself during the International Electrical Congress and convention of the National Independent Telephone Association at St. Louis, by distributing among the hundreds of delegates a handy little memoranda booklet for convention notes and appointments. A hearty invitation was also extended to all interested to visit the exhibit of the company in the Palace of Electricity, of which scores of the delegates availed themselves to their distinct satisfaction.

THE DOUBLEDAY-HILL ELECTRIC COMPANY, Pittsburg, is mailing out a reply postal card, which is intended to interest the buyer of telephone material. The sending half sets forth the advantages this firm has in the way of extent and variety of stock, and also states that price is only incidental when the quality of the goods is taken into consideration. On the reply half is printed a form for buying, which includes space for shipping directions and also an inquiry space for price on any article desired. The Doubleday-Hill Company invites correspondence from all persons interested.

THE TELEPHONE-HYGIENIC COMPANY, Los Angeles, California, has an exhibit in section 19, Palace of Electricity, St. Louis World's Fair, of its hygienic appliance for use on telephones. It is a unique, as well as practical, arrangement and its use insures absolutely sanitary conditions while one is telephoning. The device is a chemically treated and antiseptic paper roll, which by turning covers the mouthpiece of the telephone with a fresh surface each time it is used, prevents inhaling dust and germs and magnifies the sound of the voice. Full particulars and prices upon request.

THE NATIONAL CONDUIT AND CABLE COMPANY, New York and London, heralds its well known product with one of the handsomest catalogues that has ever come to this office. It is voluminous, beautifully illustrated in colors, has an embossed cover, and typographically is a work of art. Included in the book are complete specifications for the installation of cable and for supplying ducts and constructing a complete electrical subway, with accompanying illustrations. A copper table and thermometer scales are also given. For those engaged or in any way interested in conduit work this catalogue is invaluable.

FRANK B. COOK, Chicago, recognizes the fact that there are a great many small exchanges with fifty or 100 lines in use, which are not willing to put their trust in poor protection, and for their needs he has constructed a special protector and distributing frame, which he calls his type "L 3." This frame can be equipped for only ten lines if desirable, and the capacity can be increased in banks of ten pairs of protectors at any time. The Telluride Power Company at Provo, Utah, has just placed an order for one of these frames, as has also the Northeastern Telephone Company of Portland, Maine.

THE MEASURED SERVICE COMPANY, Chicago, manufacturers of measured service meters and other telephone appliances, has just issued a neat little booklet describing its product. It says of its system: "It is the only one that is under the control of the central office at all times. It prevents collusion between customer and collector. It is a credit system, which is a modern method of increasing business. The record is made by the customer; he cannot, therefore, dispute the bill. Our meter solves the problem for the company and patron alike." The company's place of business is 153-159 South Jefferson street, Chicago. It invites correspondence.

W. N. MATTHEWS & BROTHER, St. Louis, distributing agents for the Stambaugh guy anchor, have essayed an advertising scheme which is at once novel and pretentious. It is a series of 24 artistically illustrated cards setting forth the postprandial deliberations of the eleven charter members

of the Corkscrew club, which are extremely clever and at the same time edifying and amusing. It combines the entertaining with the serious and the whole is a most commendable effort in the advertising line and one that is sure to win business for this enterprising firm. The man who finds himself on the list of the Corkscrew club and receives this series may consider himself fortunate.

Bruno Grosche & Company, New York city, are circulating a folder setting forth the merits of S. P. F. Carbolineum, the great wood preserving oil, of which they sold nearly 150,000 gallons in 1903, and for which they have had a largely increased demand this year. The folder is illustrated with pictures of untreated and treated wood, which form an eloquent testimonial in behalf of S. P. F. Carbolineum. Tables of tests form another interesting feature and several testimonials set forth the superior qualities of this preservative fluid in a most emphatic manner. This firm will send their 16-page pamphlet, as well as estimates, to any who will signify the desire by letter or postal.

The Calculagraph Company of America, New York, secured an opinion from Judge Hale on August 16, in the Circuit court of the United States, District of Massachusetts, in its suit against John C. Wilson, doing business as the Automatic Time Stamp Company, for infringement of two patents numbered 424291 and 583320, owned by the Calculagraph Company, in the manufacture and sale by the defendant of the machine styled the "Timometer." The decision holds that the two patents in suit are valid and that claims of both have been infringed by the defendant in his machine. A decree is entered for the complainant for a permanent injunction, and for an accounting with costs.

The F. Bissell Company, Toledo, Ohio, is mailing out to telephone companies and telephone users all over the country a little card bearing a special design which says, "When answering this telephone don't say 'Hello,' say 'this is (insert name of person or company).' It saves you valuable time and helps the service of others." It is a clever idea and worthy of adoption by any company. Sample of card upon request. The Bissell Company has placed on the market a new grade of flame-proof wire, under the heading of "Security." The insulation of this wire is absolutely non-inflammable, a feature much desired for this class of wire. The company will also be pleased to send a sample of this wire to any one applying for same.

The Sterling Electric Company, Lafayette, Indiana, reports an unusual activity in its standard protective devices, having recently installed equipment for the following places: New York City, Savannah, Ga.; Findlay, Jackson, Crosswell, Newall, Aurelia, Norwalk, Sidney, Defiance and Oxford, Ohio; Papillion, Neb.; Hazleton, Reading, Westfield, Sherman and Blairsville, Pa.; San Marcos, Texas; Springville, Deposit, Swedesbore, Herkimer and Hudson, N. Y.; Winchester, Rochester, Greencastle and Angola, Ind.; Tampa, Fla.; Boston, Mass.; Union and Fulton, Mo.; St. Johnsbury, Vt.; Comer, Ga.; Clarion, Ia.; Wells, Minn.; Zion City, Ill.; Lincoln, Neb.; Portland, Maine; Cleburne, Texas; Topeka, Kan.; Clinton, Iowa; Suffolk, Va.

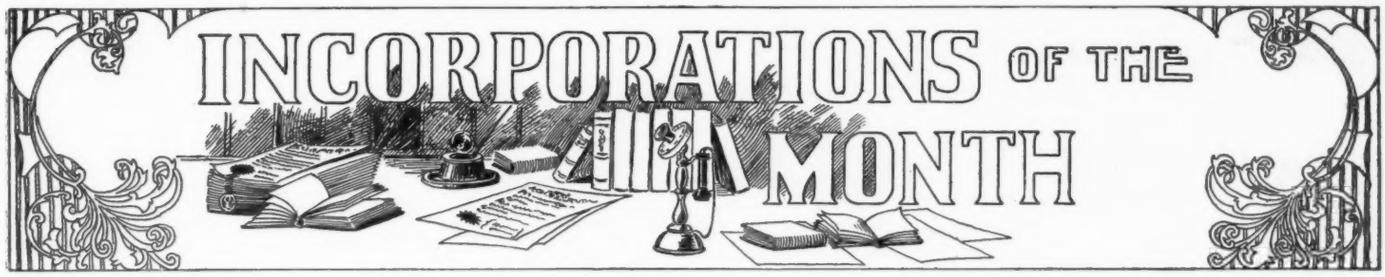
The Dean Electric Company, Elyria, Ohio, announces that it is now shipping complete telephones of both magneto and common battery types. Besides being equipped with Dean long-distance transmitters and receivers, the telephones contain many other novel features. One of these is a removable lever hook switch, the lever being held by a spring catch so as to be readily removed for shipment or keeping in stock. This prevents bending the hooks or damaging the switch wiring, through accident in handling, and allows the telephones to be packed or kept in a smaller space. It is only necessary to insert the hook lever after the telephone is installed. When forced into place, the lever is securely locked and cannot be removed without opening the telephone box.

The Locke Insulator Manufacturing Company, Victor, New York, manufacturer of the Locke patent high-potential insulators, has carried forward to a remarkable degree the manufacture of insulators for high potentials. The progress in high-tension transmission of power has been accompanied by a steady increase in test voltages to which insulators are subjected. With an eye to a still further increase, and also to enable systematic study of insulating problems, the company has recently installed a 200,000-volt transformer of 200 kilowatts capacity. The primary will be supplied with current from a 200-kilowatt motor-generator set, connected with a neighboring transmission line.

The American Electric Telephone Company, Chicago, has recently sent equipments to Independent companies at the following places: Oto, Iowa, 100-line switchboard; Greenwood, Ind., 200-line switchboard; Artesia, New Mexico, 100-line switchboard; Bryant, Ind., 100-line switchboard; Hazlehurst, Ga., 100-line switchboard; Oakland, Md., 100-line switchboard; Sheboygan, Wis., 100-line switchboard; Turner, Kan., 100-line switchboard; Oakland, Md., 100-line switchboard; Sulphur Springs, Ind., 50-line switchboard; Platte, S. Dak., 100-line switchboard; Barnard, Kan., 100-line switchboard; Moorseville, N. C., 200-line switchboard; Mercer, Mo., 100-line switchboard; College View, Neb., 100-line switchboard; South Omaha, Neb., 200-line switchboard; Chanute, Kan., 100-line switchboard; Cass Lake, Minn., 100-line switchboard; Bronaugh, Mo., 50-line switchboard.

The Monarch Telephone Manufacturing Company, Chicago, after about eighteen months of careful study and experiment, has produced a magneto switchboard, which it claims is the most up-to-date and practical board yet manufactured. The special tools required in making the drops and jacks, keys and other parts are almost finished and the company can promise deliveries of complete boards within six weeks. A small folder, as a forerunner to a more complete catalogue, is now being printed and will give the reader an idea as to the mechanical construction of the various parts, as well as the method of assembly. Several new features are shown and it will pay anyone interested in this class of apparatus to get further details. Sample drops, etc., prices and full particulars will be sent to interested parties addressing the Monarch Telephone Manufacturing Company, 12-16 South Clinton street, Chicago.

The American Electric Telephone Company, Chicago, has issued an illustrated booklet describing the Leich four-party selective telephone system. It is asserted that this is the only four-party line system that can operate without springs for the government and operation of the bells, and, further, that it is the only four-party system in which it is possible to put condensers in the circuit which can be operated at ordinary safe voltages. The company has recently received a contract to furnish for East Liverpool, Ohio, a large central-energy board, together with a complete supply of selective telephones, and this switchboard for East Liverpool has one four-party selective key in every cord circuit. All the central-energy switchboards recently furnished by the company are thus provided with four-party keys in every cord circuit, and the saving occasioned thereby is said to give excellent results. A few of the recent installations of this kind are at Ft. Worth, Tex.; Kewanee, Ill., and Ann Arbor, Mich. The four-party telephone situation has become so urgent that the booklet referred to should be of general interest. It will be sent upon request.



ALABAMA.

ENTERPRISE—The Enterprise Telephone Company. Capital stock, $3,000. Incorporators, Weldon Thompson, T. D. L. Edwards, Nick Thompson, all of Enterprise.

TALUCAH—The Inter-County Telephone Company of Morgan County. Capital stock, $2,000. Incorporators, C. E. Hogeboom, C. B. Hogeboom, Gus May, A. M. Lwellen, H. C. Simpson, J. B. Crowder, E. K. Cerrie, William Stringer, Cal Johnson, R. D. Cherrie, E. T. Giers and G. B. Campbell. The purpose of the company is to own and operate a telephone line in Morgan and Madison counties.

ALASKA.

NOME—The Alaska Telephone and Telegraph Company. Capital stock, $100,000. Directors, S. E. Boyd of Nome, Alaska; W. H. Duval, E. D. Church, J. H. Emanuel, Jr., P. V. R. Van Wick, W. M. Lovering, A. C. Shenstone, W. H. Harding, Jr., H. B. Haight and John English of New York.

CALIFORNIA.

FORTUNA—The Upper Mattole Telephone Company organized. President, E. J. Etter; secretary, F. Roscoe.

CANADA.

TORONTO—Detroit capitalists have organized another telephone company and with an authorized capital of $100,000 have obtained a charter to do business in this province. They are empowered to carry on the general business of a telephone company, with various restrictions as to the erection of poles and wires which guard the rights of private and municipal property. The incorporators are: C. W. Taylor, capitalist; R. Brooks, real estate agent; J. A. McRae, grocer; P. T. Chestey, contractor; A. D. Prosser, attorney, all of the city of Detroit. The company proposes to begin its Ontario operations in the county of Essex.

DISTRICT OF COLUMBIA.

WASHINGTON—The Home Telephone Company. Capital stock, $300,000. Incorporators, George H. Corey, Eugene Schooley, J. L. Cohencius.

ILLINOIS.

KIRKLAND—Farmers' Union Telephone Company. Capital stock, $2,500. Incorporators, William Van Wert, John Paulson, W. N. Thompson.

MAROA—The Maroa Mutual Telephone Company. Capital stock, $10,000. Incorporators, J. P. Stoutenborough, J. T. Keats and Elliott James.

FINDLAY—East Okaw Mutual Telephone Company. Capital stock, $600. Incorporators, James E. Francisco, Archibald M. Lesley, Curtis Spicer.

GALESBURG—The Dahinda Telephone Company. Capital stock, $1,000. Incorporators are Samuel Sutherland, Charles Woolsey and J. M. Oberholtsen.

FINDLAY—The Findlay Mutual Telephone Company. Capital stock, $2,400. Incorporators, Stephen D. Dole, William B. Wallace and John W. Coventry.

QUINCY—The Adams, Pike County and Hannibal Telephone Company. Capital stock, $7,000. Incorporators, W. H. Breckenridge, John W. Buttz, S. S. Inman, Charles H. Rankin.

INDIANA.

LA GRANGE—The People's Mutual Telephone Association. Capital stock, $10,000.

UNIONVILLE—The Unionville Telephone Company. Capital stock, $390. Incorporator, Mulford Young.

URBANA—The Urbana Independent Telephone Company. Capital stock, $10,000. The directors are: Emanuel Stover, Adam Cook, E. F. Baker and J. C. Schmolzried.

IOWA.

STOCKPORT—Farmers' Mutual Telephone Company. Capital stock, $10,000.

WEST UNION—The Rogers Telephone Company for Iowa. Capital stock, $50,000. Incorporators, Theo. C. Blanchard, Fred C. Blanchard, W. W. Blanchard, W. P. Hurlbut, C. A. Towne, James S. Clarkson, F. Y. Whitmore, T. L. Green, H. P. Hancock, Fritz Loeffler, Omar A. Rogers, C. H. Talmadge, Coker F. Clarkson, Augustine W. Wright, Oscar Wentworth Rogers.

KANSAS.

ST. JOHN—Happy Valley Telephone Company. Capital stock, $1,500.

GRAINFIELD—The Gove County Telephone Company. Capital stock, $5,000.

KENTUCKY.

HILLSBORO—The Hillsboro and Flemingsburg Telephone Company.

SCOTTSVILLE—The Scottsville and Bethlehem Telephone Company. Capital stock, $100,000. Incorporators, S. J. Reed, W. E. Stephens and others.

SCOTTSVILLE—The Scottsville and Barren River Telephone Company of Allen county. Incorporators, W. B. Ray, R. F. Hood and J. T. Hunt, Scottsville.

MAINE.

BLAINE—The Aroostook Farmers' Telephone and Telegraph Company, organized. Capital stock, $100,000. President, F. A. Hackett of Blaine; treasurer, H. B. Hussey of Blaine.

MARYLAND.

MADISON—The Farmers' Mutual Telephone Company of Lac qui Parle county. Capital stock, $200,000.

MECHANICSVILLE—The Southern Maryland Telephone Company. Capital stock, $10,000. The officers are: J. T. Coad, Charlotte Hall, president; L. J. Carter, Charlotte Hall, vice-president; J. B. Ballinger, Mechanicsville, secretary and Treasurer.

MICHIGAN.

STERLING—The Arenac Telephone Company.

PARTELLO—Partello and Springport Telephone Company. Capital stock, $375.

GRAND LEDGE—Residents of Grand Ledge and vicinity have organized a company, with a capital stock of $10,000, and are planning for the construction of a telephone system.

GRAND LEDGE—The Grand Ledge Telephone Company. Capital stock, $10,000. President, Clark Smith; secretary, W. H. Sutherland; treasurer, Daniel Shadduck; directors, Clark Smith, W. H. Sutherland, Austin Chipman, D. G. Kennedy.

MINNESOTA.

CERRO GORDO—The Farmers' Mutual Telephone Company. Capital stock, $20,000.

STILLWATER—The Twin Lake Rural Telephone Company, organized. President, D. B. Masterson; secretary and treasurer, E. A. Heifort.

FAIR HAVEN—The Sterling Telephone Company. Capital stock, $960. Incorporators, F. B. Phillips, W. W. Greene, Frank Longley, Fair Haven.

MORRILL—The Morrill Mutual Telephone Company. Capital stock, $50,000.

LAC QUI PARLE—The Farmers' Mutual Telephone Company. Capital stock, $20,000. Incorporators, Henrick Johnson, C. A. H. Holton, H. C. Thorsen, E. Ekeland, Julius Skoein, P. P. Smaagaard, John J. Skebba and Anton S. Mueller of Madison and Ole Holton of Dawson.

MISSISSIPPI.

BOONEVILLE—Booneville Telephone Company. Capital stock, $10,000. Incorporators, Harvey Mayers, B. G. Henning, and others.

MISSOURI.

ARCADIA—Arcadia & Drywood Telephone Company. Capital stock, $750.

ST. LOUIS—The Pan-American Construction Company. Capital stock, $2,000,000.

FAIRFAX—The Fairfax Telephone Company. Capital stock, $10,000. Incorporators, John and Minnie Eby of Holt, Mo., and R. C. Nash of Fairfax.

BROWNING—The Browning Telephone Company. Capital stock, $1,070. Incorporators, S. L. Gibson, F. M. Haymaker, M. R. Jenkins, J. J. Smith, E. B. Fields and others.

NEW JERSEY.

DRYDEN—The Dryden Telephone Company. Capital stock, $1,100. Incorporators, J. S. Campbell, B. D. Perry, J. S. Wilkins.

CAMDEN—The Delaware & Atlantic Telegraph and Telephone Company. Capital stock, $100,000. Incorporators, W. N. Bethell, James Mitchell, Theodore Spencer, Winfield S. Piersol and H. F. Ettinger.

NEBRASKA.

WILDER—Dorchester Telephone Company. Capital stock, $20,000. Incorporators, W. A. Rogers, J. E. Rogers, V. P. Musselman.

NEW YORK.

AUBURN—The Cayuga and Seneca Telephone Company. Capital stock, $20,000. Incorporators, E. Clarence Aiken, F. A. Mohr, H. W. Fluhrer.

MARILLA—The Marilla Telephone Company. Capital stock, $3,000. Incorporators, Howard Adams, J. G. Bartoo and William Bates, Marilla.

KITCHAWAN—The Kitchawan Telephone Company. Capital stock, $1,000. Incorporators, E. G. Van Pein, H. B. Forman and J. B. Erhardt, Kitchawan.

FAIRHAVEN—The Sterling Telephone Company. Capital stock, $960,000. The directors are F. B. Phillips, Frank Longley and Herbert Grant of Fairhaven.

POINT PENINSULA—The Union Telephone Company. Capital stock, $1,000. Incorporators, F. M. Wiggins, E. P. Rector, W. H. Hewitt, Point Peninsula.

NEW YORK—Alaska Telephone and Telegraph Company. Capital stock, $100,000. Incorporators, W. H. Duval, I. H. Emanuel, A. C. Sheustone, New York.

CANASTOTA—The Canastota Telephone Company. Capital stock, $25,000. Incorporators, Charles J. Wood, T. Harvey Ferris, Utica; Ervin Stattsman, Canastota, N. Y.

STAMFORD—The Delaware and Schoharie Telephone Company. Capital stock, $2,000. Directors, H. P. Hubbell and E. W. Landon of Stamford, E. P. Jones and R. H. Champion of Ruth and others.

NORTH CREEK—North Creek Telephone Company. Capital stock, $10,000. The directors are: Celia A. Pereau, W. T. Campbell, J. L. Fuller, John Little, Albert E. Prescott, North Creek; H. Prior King, Glens Falls; Embury Moston, Weaverton.

ROCHESTER—The Rolfe Electric Company. Capital stock, $150,000. Directors, Frederick Zoller, J. George Kaelber, John Nicum, George Koch, Arthur B. Enos, Rudolph Schmidt and George H. Harrison, of Rochester; Charles A. Rolfe of Adrian, Mich., and A. Miller Belfield of Chicago.

NORTH CAROLINA.

FRANKLIN—The Franklin Telephone and Electric Company. Capital stock, $15,000. Incorporators, J. S. Trotter, Samuel L. Kelly of Franklin, J. H. Weaver and W. M. Farr of Asheville.

NORTH DAKOTA.

EDINBURG—The Edinburg and Gardar Telephone Company organized. Capital stock, $10,000.

OHIO.

NEWCASTLE—Newcastle Telephone Company. Capital stock, $3,000.

DRYDEN—The Dryden Telephone Company has been incorporated. J. S. Campbell and L. D. Perry head the incorporators.

NEWCASTLE—The following are the incorporators of the Newcastle Telephone Company: J. W. Dillon, Abe Horn, W. L. Berry, W. C. Wilson, W. S. Crater.

JUNCTION CITY—Rushcreek Telephone Company. Capital stock, $5,000. Incorporators, W. S. Tuttle, W. M. Klingler, J. M. Elder, Joseph M. Folk and S. C. Elder.

MARION—The Beach Telephone Company. Capital stock, $10,000. Incorporators, W. O. Miller, L. Harruff, Joseph Klinefelter, E. F. Titlelbaugh, P. Kuehrmund.

OKLAHOMA.

GUTHRIE—The Northwestern Telephone Company. Capital stock, $5,000. Incorporators, S. M. James and others.

NORMAN—The Farmers' Central Telephone Company. Capital stock, $700. Incorporators, C. E. Fuller of Franklin, J. P. N. Haun of Norman and O. N. Abshier of Franklin.

TRYON—The Lincoln County Rural Telephone Company has been organized here with a capital stock of $5,000, for the purpose of constructing and operating telephone lines in this section.

OREGON.

DESCHUTES—The Deschutes Telephone Company. Capital stock, $3,000. Incorporators, P. L. Tompkins, George C. Steineman and W. E. Guerin, Jr.

PENNSYLVANIA.

YORK—The York Conduit Company. Capital stock, $5,000. Directors, J. E. Baker, H. W. Hoffner, E. K. McConkey.

PITTSBURG—The Pittsburg-Butler Telephone Company. Capital stock, $25,000. Directors, J. G. Splane, J. S. Weller, Pittsburg; T. J. Shufflin, Butler.

COUDERSPORT—The Allegheny Valley Telephone Company. Capital stock, $5,000. Treasurer, A. C. Boerner; directors, A. C. Boerner, F. A. Stebbins, Fred C. Leonard, C. A. Stebbins, A. F. Woods, Coudersport.

EDINBORO—The Edinboro Telephone Company. Capital stock, $6,000. Treasurer, G. W. Minimum; directors, J. F. Bigler, C. L. Darrow, Fred Le Seur, E. P. Derry, I. R. Reeder, W. A. Proud, G. W. Minimum, Edinboro.

ERIE—The Union Telephone Company. Capital stock, $10,000. Treasurer, W. B. Barnard, Philadelphia; directors, Wm. B. Trask, W. H. Wilson, James Russell, Erie; W. B. Barnard, Philadelphia; Ellis L. Orvis, Bellefonte.

MAHANOY—The Mahanoy and Mahantango Telephone Company. Capital stock, $20,000. Treasurer, I. B. Tressler. Directors, Chas. Fritz, Treverton; David Wilhour, Mandata; E. R. Reitz, Rebuck; E. S. Stroub, Herndon; I. B. Tressler, E. W. Dockey, Pillow; John Tressler, Urban; W. C. Leitzel, Klingerstown; C. R. Kehler, J. F. Kehler, J. F. Brosius, Dalmatia; W. P. Zartman, Dornsife.

TENNESSEE.

MEMPHIS—The Tri-State Telephone Company.

MEMPHIS—The Tri-State Telephone Company. Capital stock, $10,000. Incorporators, Charles D. M. Greer, James T. Warren, Frank N. Fisher, Lewis T. Kavanaugh and A. Outzen.

TEXAS.

HUBBARD CITY—The Hubbard City Telephone Company. Capital stock, $5,000. Incorporators, C. W. Hobson, A. L. Collins, Hyde Maefarian.

JUNCTION CITY—The Junction City Telephone Company. Incorporators, T. B. Phillips, M. E. Blackburn and T. J. Barley.

NACOGDOCHES—Nacogdoches Southeastern Telephone Company. Capital stock, $1,000. Incorporators, Charles Hoya, James C. Harris, Allen Seale, and others.

JACKSONVILLE—The Jacksonville Telephone Company. Capital stock, $15,000. Incorporators, W. H. Sorry, W. H. Sorry, Jr., and M. L. Sorry of Jacksonville.

WASHINGTON.

PINE CITY—The Interstate Telegraph and Telephone Company. Capital stock, $5,000. President, J. J. Stephens, Thornton; secretary and general manager, T. A. Swain.

BREMERTON—The Northwestern Peninsular Telephone & Telegraph Company. Capital stock, $50,000. The trustees are William D. Calder, S. F. Hoffman and George W. Hoffman.

WEST VIRGINIA.

BEE—The Bee Telephone Company has been organized.

RELIEF—Frederick and Shenandoah Telephone Company; Isaiah Funkhouser, president; capital stock, $500 to $1,000.

WISCONSIN.

GRANTSBURG—The Mutual Telephone Company. Capital stock, $100,000. Incorporators, Simon Theresson, A. M. Anderson, W. R. Ahistron.

UNION GROVE—Union Grove and Paris Telephone Company. Capital stock, $2,000. Incorporators, Henry Barns, O. P. Graham and C. E. Barholf.

NEW RICHMOND—Hudson Prairie Telephone Company. Capital stock, $3,000. Incorporators, C. E. Holden, Arthur D. McDiarmid and George Turner.

HOLLANDALE—The Ridgeway, Jonesville and Hollandale Telephone Company. Capital stock, $2,000. The incorporators are Robert Brunker, William Kramer and Thomas Conway.

ANNUAL MEETINGS.

ILLINOIS.

DUNLAP—The stockholders of the Dunlap Telephone Company have elected the following officers: President, Dr. Walter Allen; secretary and treasurer, Chas. Threshie; board of managers, Chas. Holmes, Frank Wakefield and A. Shaw.

INDIANA.

COLUMBIA CITY—The stockholders of the Farmers' Mutual Telephone Company have elected the following officers and directors for the coming year: President, Albert Bush; first vice-president, C. W. Alexander; second vice-president, E. E. Rindfusz; secretary and superintendent, John C. Pentz; treasurer, C. W. Banks; E. E. Gandy, C. R. Banks, Jacob Raber, Luke Barnes, Jesse Miller, J. H. Schuman, Charles W. Alexander.

THE FALLER SEMI-AUTOMATIC TELEPHONE SYSTEM.

The Faller Semi-Automatic System was invented *to perfect and simplify* the Manual Systems now in general use.

To eliminate the "*Multiple*" feature entirely, which makes Switchboards increasingly extravagant in cost, and more cumbersome as Exchanges grow in size.

To enable Telephone Companies at much less expense to themselves, to give unrivaled Automatic Service to the public.

To reduce the cost of Switchboard construction enormously.

To reduce the cost of operating more than one-half.

To enable additions to be made to Exchanges without disturbing existing apparatus.

To make such additions at less than one-half the present cost.

To make the change from Manual to Automatic Service in a modern Switchboard at moderate cost and with little interruption to the service, utilizing existing apparatus where desirable.

All these problems are successfully solved by the Faller System:

1st—It gives the best Automatic service in the world.
2d—It saves more than half the number and cost of operators.
3d—It saves more than half the average cost of construction.

These immense savings, coupled with ideal Automatic service, can bring Telephone Companies now operating at a loss into paying condition, and enable them to compete, *with assured success*, against any Telephone Company employing a "Multiple" System.

The millions of telephones connected with Manual Systems in the United States can be operated at a largely increased profit and at the same time give the public ideal Automatic service.

Approximate statistics of great interest on the points above mentioned are given below.

The Company has a complete working exhibit of its Semi-Automatic System at the World's Fair, Electricity Building, N. W. Corner of Section 24, where Telephone Switch Boards similar to those now used by both Bell and Independent Telephone Companies may be seen daily operated by experienced telephone operators, and by *Deaf-Mutes*, who have been taught the whole system of operation in an hour, the Faller System not requiring the operators either to hear or to speak to the subscriber, or to each other.

Approximate Statement of Operating Expenses in Manual Multiple and Semi-Automatic Exchanges.

Size of Exchange as indicated by the number of lines connected.	MANUAL MULTIPLE EXCHANGE		FALLER SEMI-AUTOMATIC EXCHANGE	
	Number of Employees Required	Annual Amount of Salaries	Number of Employees Required	Annual Amount of Salaries
1,000 lines	40	$ 12,000	16	$ 4,800
2,000 "	73	21,900	27	8,100
3,000 "	106	31,800	38	11,400
4,000 "	139	41,700	49	14,700
5,000 "	172	51,600	60	18,000
6,000 "	205	61,500	71	21,300
7,000 "	238	71,400	82	24,600
8,000 "	271	81,300	93	27,900
9,000 "	301	91,200	104	31,200
10,000 "	337	101,100	115	34,500

The number of employes given above in each system includes Chief Operators, Supervisors, Information Monitors, etc., etc., as well as the regular Operators at the Board, and comprises the entire force needed for each Exchange during the twenty-four hours.

Approximate Statement of the Cost of Switchboard Construction in the Manual Multiple and Semi-Automatic Systems.

Size of Board as indicated by number of lines connected.	MANUAL MULTIPLE EXCHANGE		FALLER SEMI-AUTOMATIC EXCHANGE	
	Cost of Entire Board	Cost Per Line	Cost of Entire Board	Cost Per Line
1,000 lines	$ 10,710 00	$ 10 71	$ 12,200	$ 12 20
2,000 "	26,040 00	13 02	24 800	12 40
3,000 "	45,990 00	15 33	37,800	12 60
4,000 "	70,560 00	17 64	51,200	12 80
5,000 "	99,600 00	19 92	65,000	13 00
6,000 "	133,560 00	22 26	79,200	13 20
7,000 "	171,990 00	24 57	93,800	13 40
8,000 "	215,040 00	26 88	108,800	13 60
9,000 "	262,710 00	29 19	124,200	13 80
10,000 "	315,000 00	31 50	140,000	14 00

The above figures indicate the cost of constructing a switchboard, with the necessary line terminals, cabling, keys, etc., but do not include the price of a power plant in either system, nor that of outside wiring or subscribers' instruments. These prices will vary considerably with local conditions, the rate of call per line, the quality of material used, etc., but are fairly representative.

THE FALLER AUTOMATIC TELEPHONE EXCHANGE COMPANY
Section 24, Electricity Building, The World's Fair.

WESTERN

CEDAR POLES

IDAHO WASHINGTON MONTANA

The Lindsley Brothers Co.

SPOKANE, WASHINGTON

NOTICE. Dealers advertise Western Poles who never saw one. We are located in the West, our money invested, ready at all times to give your orders our personal attention. We are producers—not scalpers—and acknowledged pioneers and original shippers of Western Cedar Poles. Write us.

GENERAL OFFICE CHICAGO TRIBUNE BUILDING

"FROM FOREST TO CONSUMER."

The Largest Producers of Cedar Poles in the Northwest.

LONG POLES A SPECIALTY.

The Humbird Lumber Co., Ltd.

SAND POINT, IDAHO.

Poles of all sizes and lengths cut from our own lands and delivered directly to you.

WRITE FOR PRICES.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

CEDAR POLES

ALL SIZES FROM 16ft. to 70ft. for PROMPT SHIPMENT

We Own Large Tracts of Cedar Timber and Produce in Our Own Camps a Large Part of the Material we Handle.

WRITE FOR A COPY OF OUR TELEGRAPH CODE FOR CEDAR PRODUCTS.

C. H. WORCESTER CO.

Suite 1206, Tribune Building, Chicago, Ill., U. S. A.

ESTABLISHED IN 1867

WRIGHT BROS.

MARINETTE, WISCONSIN.

Wholesale and Retail Dealers in All Qualities and Kinds of

CEDAR

WE MAKE A SPECIALTY OF

POLES, POSTS AND TIES

WE WILL NOT BE UNDERSOLD

WRITE FOR DELIVERED PRICES

MAIN YARDS: Marinette, Wis., Amberg, Wis., Kelso, Mich., Lathrop, Mich., Beecher Lake, Wis., DeKuester's Sidings, Wis., [on Dunbar and Wausaukee R. R.,] ***Pembine, Wis.***

Address all inquiries to ***WRIGHT BROS., MARINETTE, WISCONSIN.***

WHITE CEDAR TELEPHONE POLES

The Famous Black Duck Brand

All Sizes

BLACK DUCK

All Lengths

Yards at Black Duck, Ten Strike, & Minneapolis, Minnesota

Just now we are **LONG** on **LONG POLES**
Write us for **SPECIAL PRICES**

DUMERT-MEADER COMPANY, Minneapolis

CEDAR POLES

PRINCIPAL YARDS { CHICAGO, ILL. / MENOMINEE, MICH. / CHEBOYGAN, MICH. / WEST SUPERIOR, WIS.

E. E. NAUGLE TIE CO.

159 LA SALLE STREET

POLES—THE BEST
SHIPMENT—PROMPT
PRICES—FAIR

CHICAGO, ILL.

WRITE FOR PRICES

MENTION TELEPHONY

Please tell the Advertiser you saw his Announcement in TELEPHONY.

SAND POINT CEDAR COMPANY

SAND POINT, IDAHO

Producers of

LONG IDAHO CEDAR POLES

OUR MOTTO:
GOOD MATERIAL, PROMPT SHIPMENT.

WRITE FOR PRICES

White Cedar Poles

ALL LENGTHS AND SIZES

We are especially anxious to sell
4 in. 20 ft., 4 in. 25 ft., 5 in. 25 ft.,
6 in. 25 ft., 6 in. 30 ft., 6 in. 35 ft.
Also have for sale a large number
6 and 7 inch 40 feet and longer.

HOLT LUMBER COMPANY

STOCKS AT
Oconta, Wis., C. & N.-W. and C. M. & St. P.
Mountain, Wis., C. & N.-W.
Pound, Wis., C. M. & St. P.
Riddle Jct.. Mich., C. M. & St. P.

OCONTO, WIS.

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POLES

Large Stocks
Quick Shipments
Full Assortment

Special Prices
6" & 7" Poles 25
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MINNEAPOLIS MINNESOTA

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DEALER IN

WHITE CEDAR POLES

POSTS AND PILING.

MIXED CAR LOTS A SPECIALTY

Write for Delivered Prices.

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BELTRAMI CEDAR & LAND CO.

JOHN R. STEWART, Gen. Manager.

BLACKDUCK, - - MINNESOTA.

We offer to the trade a complete stock of White Cedar Posts and Poles from 10 to 60 ft. long. We take special care to make this stock equal to the best. We manufacture white cedar shingles and this enables us to use for shingles logs which others would ship to avoid loss. We call particular attention to our selected poles 21 ft. long, just the poles for rural lines, the extra foot making them equal to 25 ft. They are no loss as they can be used for 7 and 14 ft.

We invite correspondence and assure our old customers they will receive the same careful consideration as in the past, and to new trade we ask to ship you one car for your careful inspection and opinion.

We want to move 21 and 25 ft. Poles.

SPECIALTIES.

21 ft. Poles 4 to 6 inch.
25 ft. Telephone Poles.
6 1-2 in. 7 ft. Posts.
Short Poles 4 to 6 in. 10 to 20 ft.
Junction Poles.
7 1-2 in. 7 ft. Posts, 7 foot Posts.

The best assorted stock. The Straightest. Prompt Shipments. Mixed Car Lots.

Pittsburg & Lake Superior Iron Co.,

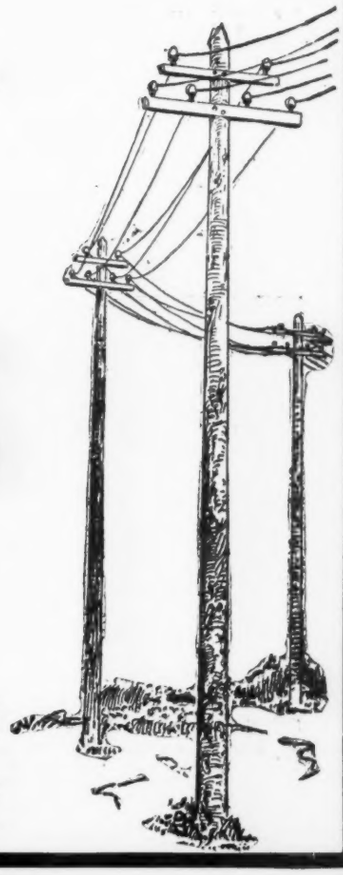
ESCANABA, MICHIGAN,

PRODUCERS AND WHOLESALERS

CEDAR POLES

FROM THE STUMP TO THE LINE.

WE ALWAYS CARRY A LARGE STOCK OF ALL SIZES OF WHITE CEDAR POLES, AND HAVING YARDS ON ALL PRINCIPAL RAILROADS IN NORTHERN MICHIGAN AND MINNESOTA, ARE IN POSITION TO MAKE IMMEDIATE SHIPMENT.



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PRODUCERS OF EVERYTHING IN CEDAR.

CEDAR POLES

All Sizes Large Stock Low Prices
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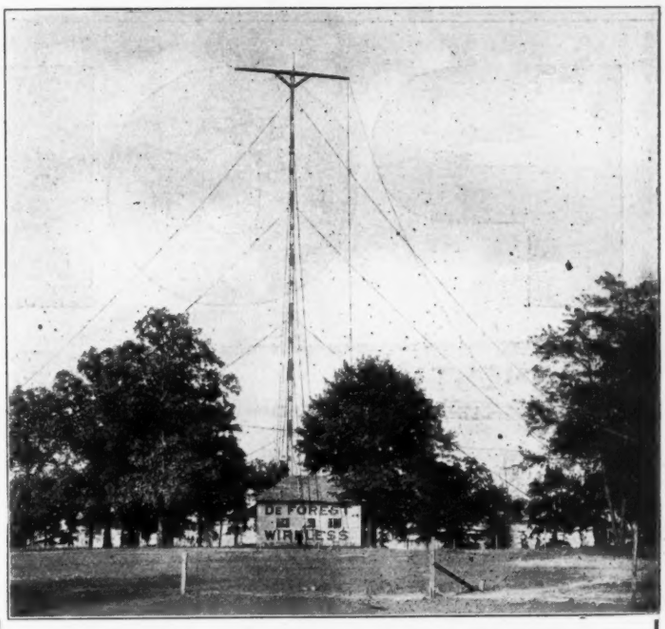
WHOLESALERS OF
MICHIGAN WHITE CEDAR

POLES
OF QUALITY

Five Yards Prompt Shipments



STOMBAUGH GUY ANCHORS

Are anchoring this mast at the Louisiana Purchase Exposition

They were simply screwed in—that's all

W. N. MATTHEWS & BRO.
DISTRIBUTORS
505 Carleton Building ST. LOUIS

WOOD PRESERVING

POLES AND CROSS ARMS

TREATED WITH ANY OF OUR VARIOUS PROCESSES

SEND FOR BOOKLET AND PRICES

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ADDRESS ALL COMMUNICATIONS TO

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POLES

ALL LENGTHS—ALL SIZES

PROMPT SHIPMENTS WRITE FOR PRICES

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Large Stock; Best Quality; Prices Right
Write us before purchasing elsewhere

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1300-2-4 OLD COLONY BUILDING, CHICAGO.
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When You See the Name

FOWLER

You Know It Means

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THE FOWLER COMPANIES
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CEDAR POLES

FRANCIS BEIDLER & COMPANY
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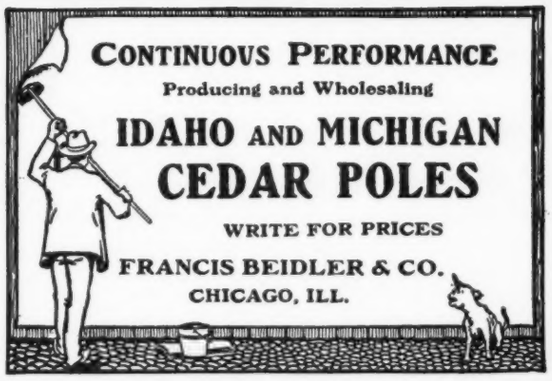

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ESCANABA, MICH.
SUPERIOR, WIS.
HERON, MONT.
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CEDAR TELEPHONE POLES

Thoroughly seasoned. Any length or size.
Immediate shipment. Seven distributing yards.
Forty years' experience.

WM. MUELLER COMPANY
Main Office, 1211-12-13 Marquette Bldg., CHICAGO.

Poles, Red Cedar, Cypress and Juniper

HOUSTON & LIGGETT,
LEWISBURG, TENN.
Yards: Missouri, Alabama, Mississippi and Texas.

POLES.

We make a Specialty of Michigan White Cedar.

Quality and Prompt Shipments are First Considerations.

Send in your orders. Sorting and Shipping Yards all through Michigan. Twenty-Five Years in the Pole Business.

W. C. STERLING & SON,
Main Office, MONROE, MICH.

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"They Never Pull Up"

THE MILLER ANCHOR
FOR
HEAVY CABLE WORK

Our Anchors can be set in from thirty to forty minutes, eight feet deep, and they will stand a strain of 40 to 50 tons.

PRICES OF ANCHORS

No. 6, 10x25 inch, 1¼ inch rod, 9 feet long, - - - - - - **$6**
No. 7, 10x30 inch, 1⅜ inch rod, 9 feet long, - - - - - - **$8**
No. 7, 10x30 inch, 1½ inch rod, 9 feet long, - - - - - - **$10**

AUGERS FOR SETTING ANCHORS

This Auger has a 9 foot stem, one inch in diameter, with an adjustable handle. As the Auger goes down the handle can be moved up the stem. Bores a 12-inch hole, the right size for all of our Anchors. Price of Auger, **$5.00.**

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20 Years in Northern Minnesota

We got in on the ground floor on our cedar timber lands and we will let you have the benefit on cedar telegraph and telephone poles. Northern Minnesota cedar and hardwood timber and farm lands for sale; write for prices on poles and lands.

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more Cedar Pole Advertisements than all other publications in the world. If you deal in Cedar Poles and are not advertising in TELEPHONY let us give you ***TEN REASONS*** why you should.

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And want advertisements not exceeding twenty words exclusive of address, will be inserted in these columns for $1,00 each If over twenty words the rate will be 5 cents per word.

POSITION WANTED—Telephone promoter and construction man of years' experience would connect himself with some company where he could become financially interested and have entire management; or will promote a new company for capitalists; or if you have an old plant and want it rebuilt economically and placed on a paying basis, write me. Address A. B., Winside, Neb.

WANTED—To communicate with parties having telephone franchise for sale. If stock can be sold locally where franchise is held, please state to what amount. If you contemplate any underground work, write me for estimate. Box 231, Wayne, Neb.

WANTED IN CANADA—A good combination telephone man, single, to visit, inspect and repair a telephone plant. Must be a good inspector. Address 267, care TELEPHONY.

FOR SALE—Two sections American express switchboard, 170 drops installed; with cross connecting board. Address Blissfield Telephone Company, Blissfield, Mich.

FOR SALE—A telephone system operating in eight counties in a western state, with five small exchanges, good Independent connections in the large cities nearby. Poor health the cause. Will make easy terms. Address 268, care TELEPHONY.

WANTED—Position as manager of exchange from 500 to 1,000. Have had nearly twelve years' experience in all positions from ground man up to superintendent and general manager of five exchanges, which position I hold at present time. Have technical education and good business ability and know how to deal with the public. Have been with present employer almost three years but wish to change on account of climatic conditions. Address 266, care TELEPHONY.

WANTED—Bright young man of good appearance who understands thoroughly technical telephony. One who has worked in the field preferred. Must be able to write descriptive booklets on telephone apparatus. Exceptional prospects for the right man. Address 264, care TELEPHONY.

POSITION WANTED—As manager or superintendent of telephone company. Have had seven years' practical experience. Address 265, care TELEPHONY.

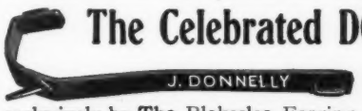
$25.00 buys telephony course and set 160 blue prints, Bell and Independent switchboard and telephone circuits now used by both. Address 269, care TELEPHONY.

FOR SALE—We have a few hundred secondhand Western telephones with extension arm transmitters and pony bipolar receivers for sale cheap. They are in good condition and are all good talkers. If interested, write. Our price is very low. Address, HOME TELEPHONE AND TELEGRAPH COMPANY, Ft. Wayne, Ind.

EXCEPTIONAL BUSINESS OPENING—Want to meet a man or syndicate that can invest $20,000 cash at once and can furnish credit promptly to the amount of $80,000 more in a telephone proposition near Kansas City, Mo., with or without service. Address with reference. No agents. THEODORE GARY, Macon, Mo.

FOR SALE—We have for sale a "Western" magneto switchboard and a large number of hand generators, all in good condition. Will be sold cheap. Write us for full information. SOUTHERN STATES TELEPHONE COMPANY, Norfolk, Va.

The Celebrated DONNELLY CLIMBER



In the future the J. Donnelly Climbers will be made and sold exclusively by The Blakeslee Forging Co. Plantsville, Conn., to whom my friends and customers will please apply. JOHN DONNELLY.

WRITE US FOR PRICES

THE BLAKESLEE FORGING CO., Plantsville, Conn.

CYPRESS POLES.

I am shipping cypress poles to fifteen states. Did you ever try them?

Let me quote you prices delivered to your city. ***LEE J. TAYLOR, Campbell, Mo.***

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DOUBLE GALVANIZED TELEGRAPH WIRE

STEEL B.B E.B.B.

HARD DRAWN COPPER WIRE

GALVANIZED WIRE STRAND FOR POLE GUYS AND CABLE SUPPORT

MADE BY

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TRENTON, N. J.

Branch Offices and Warehouses: NEW YORK CHICAGO CLEVELAND SAN FRANCISCO

Bituminized Fibre Conduit

For Underground Construction

Combines the **good features** of other conduits.
Eliminates the **bad features** existing in many kinds.
Has valuable features not found in any other ducts.
Made in 7-foot lengths with male and female joints, making construction very rapid and simple, with consequent low cost.
Alignment is perfect and permanent without tedious care and skill required in laying of butt-joint conduits.
Users are astonished by the ease and rapidity with which cables can be drawn in and this without the slightest scratching or injury to the lead covering thereof.
Made in sizes from 1-inch to 10-inch diameter.
Bends of any radius and any angle.
Write us for further information and prices, stating sizes and quantities required.

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WHEN this catalog was gotten out it was with the intention of having it contain the most complete line of high grade Telephones, Switchboards and Telephone material of any book ever published.

We Succeeded.

Now we're sending them to Telephone Companies.

You *should* have one of them. We want your business and we know we'll get it if you'll give us an opportunity of showing you the advantages of buying from us.

Write for
Our New Book No. 11.

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ALL TEMPERS
BRASS DRILL ROD
German Silver, Brass and Copper **WIRE**
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Sheet Brass of all tempers
Brass Rod, Wire and Tubing
Special Spring German Silver for telephone work

Estimates given on Telephone Parts or Special Articles of Brass, Copper, German Silver or Aluminum

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Double fibre insulation
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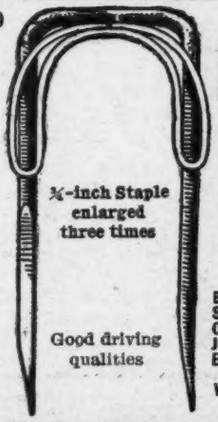
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Good driving qualities
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The New Up-to-Date Bell.

Write us for full particulars
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King of Protectors
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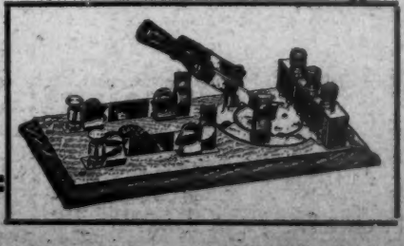

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Meritorious Independent Telephone Enterprises Financed

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Get my proposition before buying. I can save you money.

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SIZES 14 TO 40

SELF FLUXING SOLDERS

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We specialize in the manufacture of the finer sizes of magnet wire.

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IN VARIOUS WRAPS AND COLORS.

SINGLE OR PAIRED—BEESWAXED.

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